Contract No.: EP-W-09-002
WA #: 054-RICO-A282

Region 2 RAC2
Remedial Action Contract

Final Work Plan, Volume I

Wolff-Alport Chemical Company Site

Remedial Investigation/Feasibility Study

Ridgewood, Queens, New York

November 10, 2014

CDM Smith

REMEDIAL ACTION CONTRACT 2
FOR REMEDIAL RESPONSE, ENFORCEMENT OVERSIGHT,
CRITICAL REMOVAL ACTIVITIES AT SITES OF RELEASE OR
THREATENED RELEASE OF HAZARDOUS SUBSTANCES
IN EPA REGION 2

FINAL WORK PLAN
VOLUME I

WOLFF-ALPORT CHEMICAL COMPANY SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
RIDGEWOOD, QUEENS, NEW YORK
Work Assignment No.054-RICO-A282

U.S. EPA CONTRACT NO. EP-W-09-002
Document Control No.: 3323-054-02304
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November 10, 2014

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PROJECT:	EPA Region 2 RAC2 Contract No.: EP-W-09-002 Work Assignment No.: 054-RICO-A282
DOC. CONTROL NO.:	3323-054-02304
SUBJECT:	Final Work Plan, Volume I Wolff-Alport Chemical Company Site Remedial Investigation/Feasibility Study Ridgewood, Queens, New York

Dear Ms. Eng and Mr. Mongelli:

CDM Federal Programs Corporation (CDM Smith) is pleased to submit this Final Work Plan, Volume I, for the Wolff-Alport Chemical Company Site in Ridgewood, Queens, New York.

If you have any questions regarding this work plan, please contact me at your earliest convenience at (212) 785-9123.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

FOR
Jeanne Litwin, PMP, REM
RAC2 Program Manager

Enclosure

cc: D. Butler, EPA Region 2
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M. Rahmani, CDM Smith
F. Gellati, CDM Smith
RAC2 Document Control

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November 10, 2014

Prepared by: M. A. Rahmani Date: 11|10|2014

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Project Manager

Approved by: [signature] FOR Date: 11/10/14

Jeanne Litwin, PMP, REM
RAC2 Program Manager

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Acronyms and Abbreviations

µg/m^3	microgram per cubic meter
µR/h	microroentgen per hour
AALA	American Association of Laboratory Accreditation
ACM	asbestos containing material
AEC	Atomic Energy Commission
ARAR	applicable or relevant and appropriate requirement
ASC	analytical services coordinator
ATD	alpha track detector
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BVNA	Bureau Veritas North America
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
cm	centimeter
CO	contracting officer
COPC	chemical of potential concern
CRP	community relations plan
CSO	combined sewer overflow
CT	central tendency
CTE	central tendency exposure
DESA	Division of Environmental Science and Assessment
DER	data evaluation report
DO	dissolved oxygen
DOE	U.S. Department of Energy
DPM	deputy program manager
DPT	direct push technology
DQM	data quality manager
DQO	data quality objective
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
EQuIS™	Environmental Quality Information System
FAM	finance and administration manager
FFS	focused feasibility study
FS	feasibility study
GIS	geographic information system
GPS	global positioning system
HASP	health and safety plan
HEAST	Health Effects Assessment Summary Tables

HHRA	human health risk assessment
HI	hazard index
HPGe	High Purity Germanium
HQ	hazard quotient
HRS	Hazard Ranking System
HSA	hollow-stem auger
I.D.	inside diameter
IDW	investigation-derived waste
IRIS	Integrated Risk Information System
ISOCS	In Situ Object Counting System
IUR	inhalation unit risk
keV	kilo electron volt
LBA	Louis Berger and Associates
m	meter
MARLAP	Multi-Agency Radiological Laboratory Analytical Protocols
mg/kg/day	milligram per kilogram per day
mrem	millirem
NaI	sodium iodide
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NELAP	National Environmental Laboratory Accreditation Program
NYCDDC	New York City Department of Design and Construction
NYCDEP	New York City Department of Environmental Protection
NYSDOH	New York State Department of Health
OSWER	Office of Solid Waste and Emergency Response
PAR	pathway analysis report
PCB	polychlorinated biphenyl
pCi/g	picocurie per gram
pCi/L	picocurie per liter
PEF	particulate emission factor
PIC	pressurized ion chamber
PM	program manager
PO	project officer
PPE	personal protective equipment
PPRTV	Provisional Peer-Reviewed Toxicity Value
PRG	preliminary remediation goal
PRP	potentially responsible party
PSO	Program Support Office
PVC	polyvinyl chloride
QA	quality assurance
QAPP	quality assurance project plan
QAC	quality assurance coordinator
QC	quality control

QMP	Quality Management Plan
RAC	Remedial Action Contract
RACMIS	Remedial Action Contract Management Information System
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objective
RAS	routine analytical service
RESRAD	Residual Radioactivity
RfC	reference concentration
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
ROD	Record of Decision
RPM	remedial project manager
RSL	regional screening level
SF	slope factor
SM	site manager
SOW	statement of work
SVOC	semivolatile organic compound
SWA	subcontract work authorization
TAL	Target Analyte List
TCL	Target Compound List
Th-232	thorium-232
TRC	technical review committee
IRA	interim remedial action
U-238	uranium-238
UCL	upper confidence limit
UFP	Uniform Federal Policy
UMTRCA	Uranium Mill Tailings Radiation Control Act
UST	underground storage tank
VOC	volatile organic compound
WA	work assignment
WACC	Wolff-Alport Chemical Company

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Section 1

Introduction

CDM Federal Programs Corporation (CDM Smith) received Work Assignment (WA) 054-RICO-A282 under Remedial Action Contract (RAC) 2 to complete a remedial investigation (RI) and feasibility study (FS) for the United States Environmental Protection Agency (EPA), Region 2 for the Wolff-Alport Chemical Company (WACC) site located in Ridgewood, Queens County, New York. The purpose of this WA is to evaluate the nature and extent of contamination in various media as identified in the EPA Statement of Work (SOW). The media to be investigated during the RI include soil, groundwater, sediment, and building materials. The investigations described herein are designed to gather complimentary investigative data that, in conjunction with the previous data, are appropriate to complete an RI report, a human health risk assessment (HHRA), and a focused feasibility study (FFS) report.

1.1 Background and Summary of Previous Investigations

The WACC site is located at 1125 to 1139 Irving Avenue and 1514 Cooper Avenue in Ridgewood, Queens County, New York, at the county border with Brooklyn (**Figures 1-1** and **1-2**). The site includes these properties as well as properties outside these boundaries where contaminants may have migrated or threaten to migrate. Onsite soils are contaminated with thorium-232 (Th-232) and uranium-238 (U-238), including their decay chain progeny.

WACC operated at the property from the 1920s until 1954, importing monazite sand via a rail spur and extracting rare earth metals from the material. Monazite contains approximately 6% to 8% or more of thorium. Until 1947, WACC disposed of the thorium waste from monazite sand processing in the sewer (process liquors) and possibly by burial on the property (waste tailings). According to the U.S. Department of Energy (DOE), the Atomic Energy Commission (AEC) ordered WACC to halt sewer disposal of thorium waste in the fall of 1947. Thereafter, thorium was precipitated as thorium oxalate sludge and sold to the AEC. Documents indicate that WACC sold approximately 53,000 pounds and 238 drums of thorium oxalate sludge to the AEC from 1948 to 1954, and offered 400 pounds of thorium nitrate for sale to the AEC in 1954. During its years of operation, the WACC occupied three structures under the address of 1127 Irving Avenue. The operation also included two yard areas: one between the former company's buildings facing Irving Avenue, and the other on the eastern end of the property at the northern end of Moffat Street. These former yard areas, now occupied primarily by structures, were reportedly used as staging areas for monazite sands or waste tailings containing Th-232. The WACC did not operate out of 1125 Irving Avenue (Lot 46) or 1514 Cooper Avenue (Lot 48), but those properties are affected by the radioactive materials at the site.

The nearly triangular subject property affected by contamination, which includes Lots 31 (partial), 33, 42, 44, 46, and 48 of Queens Borough Block 3725, covers approximately 0.75 acre bound by Irving Avenue to the southwest, Cooper Avenue to the northwest, and an active cabinet manufacturer to the east. At present, the property is covered primarily with contiguous structures, except the former rail spur along its eastern edge, which is an unpaved area where the tracks are no longer present. The buildings contain a delicatessen/grocery, office space, residential apartments, tire shop, and former mini-ATV shop (1125 Irving Avenue; Lot 46); an auto repair shop and office space (1514 Cooper Avenue; Lot 48); an auto body shop (1127 Irving Avenue; Lot 44); and two warehouses (1129 Irving Avenue; Lot 42 and 1133-1139 Irving Avenue; Lot 33). The portion of the former rail spur (portion of Lot 31) adjacent to the WACC buildings is fenced, covered with gravel-like material and used as an automobile storage/ parking area by the auto repair shop. The non-fenced portion of the former rail spur, which is not adjacent to the WACC buildings is partially vegetated.

Gamma radiation from U-238 and Th-232 and their progeny may pose a hazard to residents and workers in close proximity to the former WACC facility property. Elevated gamma radiation was detected along Irving Avenue, where there is pedestrian and worker traffic. The neighborhoods surrounding the subject property contain light industry, commercial businesses, and residences. The sidewalk and street along Irving Avenue are typically filled with vehicles being serviced by the businesses at the property. The intersection of Irving Avenue and Moffat Street (i.e., the southern corner of the subject property) is an active area for trailer parking and unloading. There are three currently unoccupied apartments over the delicatessen/grocery, and other housing begins across the street on both Cooper and Irving Avenues. There are indications that former warehouses on Moffat Street, in close proximity to the site, are now used for residential purposes. The residential area is densely populated and contains multi-family homes and apartments; a public elementary school is located 900 feet to the southwest. An active rail line passes within 125 feet southeast of the subject property, and the Cemetery of the Evergreens is present to the east and south on the opposite side of the active rail line.

Radiological surveys by New York City, state, and federal agencies have identified radioactivity above background levels within portions of subject property buildings, in soils beneath and around the former WACC facility and adjacent buildings, and above adjacent sidewalks, streets, and sewers. During an investigation by the New York City Department of Design and Construction (NYCDDC) in 2009-2010, waste tailings consisting of black or gray ash-like material were found in a contaminated soil layer beneath subject property buildings, beneath sidewalks and asphalt surfaces of Irving Avenue and Moffat Street, and within the surface soils of the former rail spur. The depth of visibly contaminated soil at the subject property is typically within the top 1 to 4 feet under the pavement or ground surface; however, a lens was reported at 8 to 10 feet beneath the auto body shop. Th-232 concentrations up to 1,133 picocuries per gram (pCi/g) were reported for the soil samples containing waste, while background was reported to be 0.5 pCi/g to 1.0 pCi/g. The radioactive decay of Th-232, which has a half-life of 14 billion years, proceeds as follows (radioactive half-lives in parentheses): radium-228 (5.8 years), actinium-228 (6.1 hours), thorium-228 (1.9 years), radium-224 (3.7 days), radon-220 (56 seconds), polonium-216 (0.15 second), lead-212 (11 hours), bismuth-212 (61 minutes), polonium-212 (310 nanoseconds), thallium-208 (3.1 minutes), and lead-208 (stable). Due to the length of time since processing of the monazite sands began (about 60 years or more), it is reasonable to assume secular equilibrium (i.e., the activities of all radionuclides within the series are nearly equal) for these radionuclides in the waste materials abandoned at the site.

One of the key components of the Th-232 decay series is radon-220, a radioactive gas commonly and hereinafter referred to as thoron, which emanates from surfaces where Th-232 is present. During the

NYCDDC investigation at the WACC subject property, thoron was detected in the deli basement at a concentration of 12.7 picocuries per liter (pCi/L).

In September 2012, EPA collected gamma radiation exposure rate measurements and thoron concentration measurements on and around the perimeter of the source area and at background locations. The gamma radiation exposure rate measurements identified hot spots along the former rail spur and in the sidewalks and streets adjacent to the former facility. The contaminated area (i.e., the source area), defined as the extent to which the gamma radiation exposure rates equal or exceed two times the site-specific background gamma radiation exposure rate, extends throughout most of the subject property and in some of the adjacent street and sidewalk areas. Thoron gas concentrations exceeded two standard deviations above the mean site-specific background concentration (0.46 pCi/L) at the WACC site. The highest thoron concentration, 366 pCi/L, was observed at the former rail spur area.

Recent investigations have indicated that residual contamination still exists in or around the sewer lines downstream of the facility. During periods of heavy flow such as rainstorms, combined sewer overflows (CSOs) discharge from this combined sewer system to Newtown Creek west of the subject property. In 2013, Bureau Veritas North America (BVNA) performed an investigation on behalf of the New York City Department of Environmental Protection (NYCDEP) to assess the current impact to the sewers in the vicinity and downgradient of the WACC property. Results of soil borings found no contaminated soils along the sewer lines with the exception of those adjacent to the WACC property. However, surveys in the sewers did detect radiological constituents above background concentrations at least as far downgradient as the intersection of Irving Avenue and Halsey Street (approximately 0.25 mile from the WACC).

Since October 2012, EPA has conducted additional monitoring and mitigation activities at the WACC subject property and vicinity. Surveys conducted in October and November 2012 confirmed elevated radiation levels in some areas. In December 2012 and February 2013, radon and thoron monitoring in onsite buildings found elevated readings. In April 2013, EPA installed fencing at the site and shielded portions of the radioactive soil with rock and clean fill to reduce accessibility to the waste material. Additional shielding consisting of lead, steel, and concrete was installed within several structures at the WACC property and along a portion of the Irving Avenue sidewalk. A radon mitigation system was also installed at the property. These activities were completed in December 2013. Following the placement of the shielding and radon mitigation system, EPA conducted surveys that showed exposure rates had been reduced between 69 to 94% at the subject properties. Radon concentrations decreased by more than half. The site was listed on the National Priorities List on May 12, 2014.

1.2 RI/FS Objectives

The purpose of this RI/FS is to select a remedy to eliminate, reduce, or control risks to human health and the environment at the WACC site. This work plan is designed to provide the framework for conducting the RI/FS activities at the site. The objectives of this investigation are to:

- Review and evaluate the studies and investigations performed at the site to date
- Perform the appropriate amount of sampling to complete characterization of the site

- Provide adequate data to support the selection of an approach for site remediation and development of a Record of Decision (ROD)

1.3 Work Plan Content

This work plan contains three sections as described below.

- Section 1 – Introduction: Presents the site description, site history, previous investigations, and format of the work plan.
- Section 2 – Work Plan Approach: Presents an overview of the technical approach to performing the RI/FS studies, the project schedule, project management plan, and quality assurance (QA) and document control.
- Section 3 – Task Plans: Discusses each task of the RI/FS in accordance with the site SOW, EPA guidance documents, and meetings and discussions with EPA.
- Section 4 – References: Lists references used to develop the work plan.

For presentation purposes, figures and tables are presented at the end of this Volume I Work Plan.

Section 2

Work Plan Approach

2.1 Technical Approach to the RI/FS

CDM Smith has developed the technical approach described herein in accordance with the EPA SOW and to ensure that all field work and submittals meet the requirements of the following documents and policies:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended
- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, EPA/540/G-89/004, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01 (EPA 1988)
- Other applicable federal, state, and local requirements

CDM Smith reviewed all available information for the site prior to formulating the approach presented in this work plan. The RI/FS for the site will include an RI report, HHRA, and FFS report.

The investigation scope is intended to address data gaps identified through review of previous investigations, in support of characterization of the nature and extent of site contamination. A list of the investigations evaluated is included in Section 3.1.6 of this document; data gaps on which this investigation is based are included in the Technical Scoping Meeting Minutes submitted August 7, 2014. The sampling approach is discussed in Section 3.3, with rationale specific to each activity provided within their corresponding descriptions. A site-specific quality assurance project plan (QAPP) detailing sample and analytical requirements for the field investigation and a health and safety plan (HASP) will be submitted separately. The RI report will provide a complete evaluation of sampling results

An HHRA will be conducted according to EPA's Risk Assessment Guidance for Superfund (RAGS)), or according to the most recent EPA guidance and requirements. The risk assessments will include identification of chemicals of potential concern (COPCs) for each medium by comparison of maximum detected concentrations to regulatory approved screening levels; toxicity information for COPCs; ; and characterization of potential risk of COPCs in the absence of any remedial action.

An FFS will be completed in accordance with the EPA's Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988), or the most recent EPA FS guidance document. The FFS will develop and screen remedial alternatives and provide detailed analysis of selected alternatives, including the "No Action" alternative. The remedial alternatives will be evaluated against the nine criteria required by EPA guidance documents: (1) overall protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements (ARARs); (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume through treatment; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state acceptance; and (9) community acceptance.

2.2 Project Organization

The proposed project organization is shown in **Figure 2-1.**

2.3 Quality Assurance

All work by CDM Smith on this WA will be performed in accordance with the CDM Smith RAC2 Quality Management Plan (QMP) (CDM Smith 2012). The RAC2 quality assurance coordinator (QAC) will maintain QA oversight for the duration of the WA. A CDM Smith QAC has reviewed this work plan for QA requirements. A QAPP governing field sampling and analysis is required and will be prepared in accordance with the Uniform Federal Policy (UFP) for QAPPs and current EPA Region 2 guidance and procedures.

The CDM Smith site manager (SM) is responsible for implementing appropriate quality control (QC) measures on this WA. Such QC responsibilities include:

- Implementing the QC requirements referenced or defined in this work plan and in the QAPP
- Adhering to the CDM Smith RAC Management Information System (RACMIS) document control system
- Organizing and maintaining WA files
- Conducting planning meetings, as needed, in accordance with the RAC2 QMP
- Ensuring the proper data quality objectives (DQOs) are implemented for the WA

Technical and QA review requirements as stated in the QMP will be followed on this WA, except that the SM will select reviewers with the experience outlined in the QA Manual or select reviewers from the RAC2 Region 2 contract review plan.

Document control aspects of the program pertain to controlling and filing documents. CDM Smith has developed a program filing system that conforms to EPA's requirements to ensure that the documents are properly stored and filed. This system will be implemented to control and file all documents associated with this WA. The system includes document control procedures, a file review, an inspection system, and file security measures.

The RAC2 QA program includes both self-assessments and independent assessments as checks on quality of work performed on this WA. Self-assessments include management system audits, trend analyses, calculation checking, data validation, and technical reviews. Independent assessments include office, field, and laboratory audits and the submittal of performance evaluation samples to laboratories if required. One field will be performed during this WA.

2.4 Project Schedule

A project schedule is included as **Figure 2-2**. The project schedule assumes the provision of adequate funding and timely review of documents by EPA throughout the project.

2.5 General Requirements

General requirements include those relating to sustainable (or green) remediation, project data management and electronic data deliverables (EDDs), and record-keeping, as described in the following sections.

2.5.1 Green Remediation

Green remediation is the practice of considering all environmental effects of the implementation of a remedy and incorporating options to maximize the net environmental benefit of cleanup actions. In accordance with EPA's strategic plan for compliance and environmental stewardship, EPA strives for cleanup programs that use natural resources and energy efficiently, reduce negative impacts on the environment, minimize or eliminate pollution at its source, and reduce waste to the maximum extent possible. EPA's Region 2 Superfund program supports the adoption of "green site assessment and remediation," which is defined as the practice of considering all environmental impacts of studies, selection, and implementation of a given remedy, and incorporating strategies to maximize the net environmental benefit of cleanup actions (see http://www.clu-in.org/greenremediation). In addition, EPA established a "Clean & Green" policy to enhance the environmental benefits of Superfund cleanups by promoting technologies and practices that are sustainable.

To the extent practicable, CDM Smith will explore and implement green remediation strategies and applications in the performance of the requirements of this WA to maximize sustainability, reduce energy and water usage, promote carbon neutrality, promote industrial materials reuse and recycling, and protect and preserve land resources. The following practices may be performed during RI/FS activities:

- Obtain trailer and materials locally
- Work with local staff to reduce fuel consumption
- Minimize the number of sample shipments to the analytical laboratory (while still meeting the holding time requirements)
- Use energy efficient lighting and appliances when available
- Investigate options available for using renewable energy
- Use ultra-low sulfur or biodiesel fuels
- Use an In Situ Object Counting System (ISOCS) for field measurement of radioactively contaminated materials to minimize sample shipment and processing
- Minimize materials handling during excavation and consolidation of the waste

- Use soil erosion and sediment control practices to minimize impacts from the investigation on surrounding areas

CDM Smith will maintain records of strategies implemented and report this information to EPA in its monthly progress reports or as requested by EPA.

2.5.2 Laboratory Accreditation/Certification Requirements

All environmental and analytical subcontract laboratories to be used for execution of the RI/FS under this WA will be currently certified or accredited for the matrices and analyses to be conducted. The certification or accreditation shall be granted by the National Environmental Laboratory Accreditation Program (NELAP), the American Association of Laboratory Accreditation (AALA), or the EPA Contract Laboratory Program (CLP). CDM Smith will ensure that the certification or accreditation is valid at the time of the subcontract award and is maintained through the duration of the WA period of performance.

2.5.3 Project Data Management and Electronic Data Deliverable Requirements

The goals of project data management are to store and manage the data generated during the project so they are ready and available for analysis and reporting, and to prepare the project EDD for submittal to EPA. Examples of the data to be managed during this project include logbooks, maps, field data sheets, location data (survey and global positioning system [GPS] data), well construction data, water level data, borehole geophysical data, field results, and sample analytical results. Data on paper will be stored and managed using CDM Smith's project filing system. Data in electronic format will be stored and managed using Environmental Quality Information System (EQuIS™) environmental database software from EarthSoft (version 5.5 or current version). The EQuIS™ database provides a standard format for data storage and reporting. It will also support the analysis and presentation of data using gINT, Microsoft Excel, ArcMAP geographic information system (GIS) software, AutoCAD, Surfer, and other applications as needed. The data stored in EQuIS™ will ultimately be used to generate the required EPA Region 2 EDD.

The key data management roles on the project include the data provider, the SM, the data quality manager (DQM), project staff, the EQuIS™ database administrator, and the analytical services coordinator (ASC). The SM and DQM work together to ensure that data management is conducted in a timely and efficient manner and that proper QA/QC procedures are followed. Data will be uploaded to the database from Excel EDD files prepared by project staff to ensure that the data are complete and accurate. The EQuIS™ database administrator is responsible for verifying that Excel EDDs comply with EPA Region 2 requirements, loading the EDDs into EQuIS™, and creating reports. The ASC logs analytical EDDs received from laboratories into the EDD tracking system, works with laboratories, assists in arranging data validation, and troubleshoots problem analytical EDDs.

At the conclusion of the project, CDM Smith will provide EPA with a project EDD that includes field sampling and laboratory analytical results, geologic data, and well location data in accordance with Region 2's policies, guidelines, and formats. CDM Smith will follow Region 2's Electronic Data Deliverable Comprehensive Specification Manual 3.0 (EPA 2014a) for the systematic implementation of EDD requirements, data preparation, and identification of data fields required for data submissions. Other Region 2 EDD guidance and requirements documents that CDM Smith will follow include the Electronic Data Deliverable Valid Values Reference Manual and tables (EPA 2014b), the Basic Manual for Historic Electronic Data (EPA 2012), the Standalone EQuIS Data Processor User Guide (EarthSoft, Inc. 2008), and Region 2 EDD templates (EPA 2011a).

2.5.4 Record-Keeping Requirements

CDM Smith will maintain all technical and financial records for this WA in accordance with the requirements of the SOW and the technical direction of the EPA remedial project manager (RPM). These technical and financial records will be in sufficient detail to support decisions made during this RI/FS. At the completion of the WA, CDM Smith will submit three bound copies of the official record of the work and one copy of the major deliverables in electronic format to the EPA RPM, with one copy to the EPA records manager.

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Section 3

Task Plans

The tasks identified in this section correspond to EPA's SOW for the site, dated June 3, 2014. The tasks for the RI/FS presented below correspond to the applicable tasks presented in the Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA 1988). In addition, EPA's SOW includes a task for project closeout. The task presentation order and numbering sequence correspond to the work breakdown structure provided in EPA's SOW.

3.1 Task 1 – Project Planning and Support

The project planning task generally involves several subtasks that must be performed in order to develop the plans and the corresponding schedule necessary to execute the RI/FS. These subtasks include project administration, conducting a site visit, performing a review and detailed analysis of existing data, attending technical meetings with EPA and other support agencies, preparing this RI/FS work plan, preparing the QAPP and HSP, procuring and managing subcontractors, and preparation the Pathway Analysis Report (PAR).

3.1.1 Project Administration

CDM Smith will provide the following project administration support in the performance of this WA.

The SM will:

- Prepare the technical monthly report
- Review weekly financial reports
- Review and update the schedule
- Communicate weekly with the EPA RPM
- Prepare staffing plans

The Program Support Office (PSO) personnel will:

- Review WA technical/financial status reports
- Prepare monthly progress reports
- Manage technical resources
- Review the WA budget
- Respond to questions from the EPA project officer (PO) and contracting officer (CO)
- Prepare monthly invoices

3.1.2 Attend Scoping Meeting

The SM, program manager (PM), deputy program manager (DPM), and finance and administration manager (FAM) attended a scoping meeting at the EPA Region 2 office in New York City on June 23, 2014. Meeting minutes were prepared and submitted to EPA on July 8, 2014.

3.1.3 Conduct Site Visit

The initial site visit was performed on June 26, 2014 by EPA and CDM Smith. In attendance were the EPA RPM, CDM Smith SM, CDM Smith RI task leader, and CDM Smith senior health physicist. The site visit included visual observation of site conditions and current uses of surrounding and potentially involved properties.

3.1.4 Develop Draft Work Plan and Associated Cost Estimate

CDM Smith prepared the draft RI/FS work plan in accordance with the contract terms and conditions. CDM Smith used existing site data and information, information from EPA guidance documents (as appropriate), and direction provided by the EPA RPM during the technical scoping meeting as the basis for preparing the work plan. The draft work plan includes CDM Smith's technical approach for each task to be performed; a description of the work products that will be submitted to EPA; a proposed project schedule; and a list of key personnel performing work on the project. The draft work plan budget (Volume 2) contains a detailed cost breakdown, by subtask, of the direct labor costs, other direct costs, projected base fee and award fee, and all other specific cost elements required for performance of each of the subtasks included in the SOW. The draft work plan was submitted on August 15, 2014.

3.1.5 Negotiate and Revise Draft Work Plan/Budget

CDM Smith prepared this Final Work Plan Volume 1, incorporating Newtown Creek sediment sampling and ecological risk assessment subtasks as prescribed within work assignment amendment #1 (and proposed within the Work Plan Addendum, dated October 8, 2014), as well as revisions based on the resolution of comments received on the Draft Work Plan.

CDM Smith personnel will attend a work plan negotiation meeting at EPA's direction. EPA and CDM Smith personnel will discuss and agree upon the final technical approach and costs required to accomplish the tasks detailed in the work plan. CDM Smith will submit a negotiated work plan and budget incorporating the agreements made in the negotiation meeting.

3.1.6 Evaluate Existing Data and Documents

As part of the preparation of the work plan, CDM Smith reviewed data collected during previous investigations at the site. Analytical data and other information from these background documents were incorporated, where applicable, into this planning document. This subtask is ongoing and will be completed during preparation of the QAPP. Existing site background information and documentation include the following documents:

- 2010 NYCDCC Phase I/Phase II Environmental Site Assessment Reports for the Former Wolff-Alport Chemical Corporation Site (Louis Berger and Associates [LBA] 2010a/b)

- 2010 NYCDCC Final Draft Radiological Scoping Survey for the Former Wolff-Alport Chemical Corporation Site (LBA 2010c)
- 2012 U.S Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) Health Consultation (ATSDR 2012)
- 2013 Hazard Ranking System (HRS) Documentation Record for the Wolff-Alport Chemical Corporation Company (EPA 2013a)
- 2014 BVNA/NYCDEP Assessment of Potential Radiological Impact Within and Adjacent to Combined Sewer System near the Former Wolff-Alport Chemical Corporation Facility (BVNA 2014)
- 2014 Multi-Agency Former Wolff Alport Chemical Company Neighborhood Radiological Assessment (New York State Department of Health [NYSDOH] et al. 2014)
- 2014 Weston Solutions, Inc./EPA Radiation Assessment and Response Action Report for the Former Wolff-Alport Chemical Company Site (Weston Solutions, Inc. 2014)
- 2014 ATSDR's Supplement to the2012 Health Consultation (ATSDR 2014)
- Other files and records from the U.S. Geological Survey and other federal sources

3.1.7 Quality Assurance Project Plan

CDM Smith will prepare a site-specific QAPP to include activities that will be performed as part of the RI/FS. The QAPP will be prepared in accordance with EPA QA/R-5, "EPA Requirements for Quality Assurance Project Plans" (EPA 2001b); EPA 505-B-04-900A, "Uniform Federal Policy for Quality Assurance Project Plans" (EPA 2005a) and optimized 2012 worksheets; current EPA Region 2 QAPP guidance and procedures; and CDM Smith's current approved QMP for this contract (CDM Smith 2012). The QAPP will be prepared using CDM Smith's approved generic QAPP for standard chemistry parameters with an attachment (Radiological Sampling and Analysis Plan) to cover procedures specific to the investigation/analysis of radioactive materials.

3.1.8 Health and Safety Plan

CDM Smith will prepare a HASP to specify the health and safety requirements for all field activities to be performed during the RI. The HASP will be in accordance with Subpart B, Section 150, "Worker health and safety" of the National Contingency Plan (NCP) at 40 Code of Federal Regulations (CFR) 300.150, and with 29 CFR 1910.120 (1)(1) and (1)(2). The HASP will include provisions for a radiation safety awareness training to be performed for project personnel, including subcontractors. The HASP will be subject to revision, as necessary, based on new information that is discovered during the field investigation.

3.1.9 Non-RAS Analyses

Per discussions with EPA during the scoping meeting, all samples to be collected under this RI/FS will be analyzed by a subcontract laboratory due to the presence of radioactive contamination. CDM Smith will procure laboratory services including a SOW for analysis of all chemical and radiological samples by a subcontract laboratory. The number of samples and analytical parameters are defined in **Table 3-1**. The analytical methods, detection limits, holding times, parameters, field sample preservation, and QC samples will be provided in the QAPP, which will be appended to the laboratory procurement documents.

CDM Smith will select laboratory subcontractors based on the ability to meet the technical and analytical QA and QC requirements in the project SOW. The laboratory subcontractor will be selected using EPA-approved criteria and will follow the most current EPA protocols and Region 2 QA requirements. The CDM Smith regional QAC will ensure that the laboratory meets all EPA requirements for laboratory services. Project-specific SOWs govern the analytical work performed by the subcontract laboratory. CDM Smith will monitor the subcontractor laboratory’s analytical performance.

3.1.10 Meetings

It is assumed that CDM Smith will participate in 8 meetings and 16 conference calls over the course of the RI/FS. It is assumed that 4 meetings will be held at EPA’s Region 2 office in New York City, and 4 meetings will be held at the site. Two people from CDM Smith will attend each meeting, and CDM Smith will prepare meeting minutes for review by the EPA RPM.

A technical scoping meeting was held on July 24, 2014 in person and via teleconference with personnel at the EPA Region 2 office in New York City. CDM Smith attendees included the DPM, SM, RI task leader, senior health physicist, senior human health risk assessors, and senior engineer. EPA attendees included the PO, RPM, human health risk assessor, radiation specialist, and hydrogeologist. CDM Smith gave a slide presentation including a brief summary of the site history, discussion of data gaps, and a proposed technical approach for completion of the RI. Meeting minutes were prepared and submitted to EPA on August 5, 2014.

3.1.11 Subcontractor Procurement

CDM will identify, solicit, and award the subcontracts necessary to perform the requirements of the RI/FS WA. Subcontractors to support the RI/FS will include laboratory services, drilling services, vibra-core sediment sampling services, investigation-derived waste (IDW) characterization and disposal services, surveying services (topographic, site, and geophysical), and building materials inspection services.

A project specific team subcontractor, Greenwich Environmental, will supply all equipment to complete radiation surveys and field analysis, and will perform radiation technical services. A subcontract work authorization (SWA) will be prepared for this work.

3.1.12 Perform Subcontract Management

CDM Smith will perform the necessary management and oversight of the subcontracts, institute procedures to monitor progress, and maintain systems and records to ensure that the work proceeds in accordance with the subcontract and RAC2 requirements. CDM Smith will also review and approve subcontractors’ invoices and issue any necessary subcontract modifications.

3.1.13 Pathway Analysis Report

In accordance with OSWER Directive 9285.7-47, RAGS Part D (EPA 2001a), CDM Smith will provide EPA with standard tables, worksheets, and supporting information for the baseline HHRA. The pathway analysis report (PAR) will consist of RAGS Part D Standard Table 1 through 6 series (for non-radionuclides) and supporting text. For radionuclides, tables will include output from the Residual Radioactivity (RESRAD) computer model which provides both the assumptions input into the model and the resulting calculations as the model output. The PAR will summarize the key assumptions regarding potential receptors, exposure pathways, exposure parameters, and chemical and radionuclide toxicity values that will be used to estimate risk in the baseline HHRA. Because RAGS Part D Tables 2 and 3 series summarize site data, these tables for the PAR will be prepared after analytical data collected during the RI are available. The PAR will be developed in accordance with EPA guidance set forth in the following documents, or the most recent versions thereof:

- RAGS Volume I: Human Health Evaluation Manual (Part A) (EPA 1989)
- RAGS Volume I: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) (EPA 2001a)
- RAGS Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) (EPA 2004a)
- RAGS Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) (EPA 2009)
- RAGS Volume I: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (EPA 1991)
- Exposure Factors Handbook (EPA 2011b)
- Soil Screening Guidance for Radionuclides: Technical Background Document (EPA 2000)
- Integrated Risk Information System (IRIS), http://www.epa.gov/iris (EPA 2014c)
- Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (EPA 2014d)
- Preliminary Remediation Goals (PRGs) for Radionuclides (EPA 2011c)
- ProUCL Version 5.0.00 User Guide (EPA 2013b)
- User's Manual for RESRAD Version 6 (Argonne National Laboratory Environmental Assessment Division 2001)
- User's Manual for RESRAD-BUILD Version 3 (Argonne National Laboratory Environmental Assessment Division 2003)
- Radiation Risk Assessment at CERCLA Sites: Q and A (EPA 2014e)

- OSWER Directive 9200.1-120: Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors (EPA 2014f)
- OSWER Directive 9283.1-42: Determining Groundwater Exposure Point Concentrations, Supplemental Guidance, (EPA 2014g).

Additional guidance that addresses site-specific issues and chemical contaminants will be utilized in consultation with EPA Region 2. CDM Smith will perform the following activities under this subtask, which will form the basis for the PAR.

Recent guidance from EPA (EPA 2014e) will be used to help evaluate existing data to support risk assessment and to assist in development of any additional site characterization needed. This guidance will also be consulted for evaluation of ARARs and other standards and policy that may be pertinent for risk management. For quantitative risk assessment, RESRAD models will be used for calculations and EPA (2014e) will be consulted to help ensure consistency of inputs to these models with EPA recommendations for risk assessment.

Data Evaluation

CDM Smith will review available information on the hazardous substances present at the site and identify COPCs in each medium by comparing the maximum detected concentrations to the regulatory approved screening levels. The COPCs to be used in the risk assessment will be selected in accordance with EPA Region 2 procedures as presented in RAGS Part A (EPA 1989). COPCs will include radionuclides and non-radionuclides. Radionuclides and non-radionuclides are identified as COPCs if the maximum detected concentration exceeds the respective screening levels. Additional selection criteria that will be used to identify the COPCs at the site include the following:

- Frequency of detection in analyzed medium (e.g., soil, groundwater)
- Historical site information/activities
- Radiotoxicity and chemical toxicity
- Risk-based concentrations screened using the most recent version of the EPA PRGS for radionuclides (EPA 2011c) Risk-based concentrations screened using the most recent version of the EPA RSLs (EPA 2014d) For chemicals that are beneficial nutrients (e.g., calcium, magnesium, potassium, and sodium), the expected daily intake from the site will be determined to ensure that concentrations are within the range that is considered healthful prior to eliminating these chemicals from the risk assessment

Exposure Assessment

Exposure assessment involves the identification of the potential human exposure pathways at the site for current and potential future land use scenarios. In general, the exposure assessment will be representative of current conditions for current receptors and predicted future conditions for future receptors based on fate and transport analysis in the absence of remedial actions. Potential release and transport mechanisms will be identified for contaminated source media. Exposure pathways will be identified that link the sources, types of environmental releases, and environmental fate with receptor locations and activity patterns. Generally, an exposure pathway is considered complete if it consists of the following elements:

- A source and mechanism of release
- A transport medium
- An exposure point (i.e., point of potential contact with a contaminated medium)
- An exposure route (e.g., ingestion) at the exposure point

All current and future land use scenario exposure pathways considered will be presented; however, only some may be selected for quantitative analysis. Justifications will be provided for those exposure pathways retained and for those eliminated. Current onsite land use is commercial/industrial and residential. Exposure of offsite receptors to contamination has not been determined at this time. Based on current data, offsite exposure to site-related contamination is not significant; however, the potential for offsite exposure will be reevaluated using data collected during the RI. For current land use scenarios, potential complete exposure pathways are summarized below.

<u>Site Commercial/Industrial Workers (Adults)</u>

- Surface soil
  - External gamma radiation
  - Incidental ingestion
  - Dermal contact
  - Inhalation of dust and/or radon and/or thoron emissions
- Building surfaces, sidewalks, and streets
  - External gamma radiation
  - Inhalation of dust and/or radon and/or thoron emissions

<u>Residents (Adults and Children 0 to 6 Years Old)</u>

- Building surfaces, sidewalks, and streets
  - External gamma radiation
  - Inhalation of dust and/or radon and/or thoron emissions
- Surface soil
  - External gamma radiation
  - Incidental ingestion

  - Dermal contact
  - Inhalation of dust and/or radon and/or thoron emissions

Trespassers (Adolescents)

- Surface soil
  - External gamma radiation
  - Incidental ingestion
  - Dermal contact
  - Inhalation of dust
- Building surfaces, sidewalks, and streets
  - External gamma radiation
  - Inhalation of dust and/or radon and/or thoron emissions

Public (Adults and Children 0 to 6 Years Old)

- Building surfaces, sidewalks, and streets
  - External gamma radiation
  - Inhalation of dust and/or radon and/or thoron emissions

Construction/Utility Workers

- Surface and subsurface soil
  - External gamma radiation
  - Incidental ingestion
  - Dermal contact
  - Inhalation of dust and/or radon and/or thoron emissions
- Sewers
  - External gamma radiation
  - Inhalation of radon and/or thoron emissions

Offsite Workers and Residents

- To be determined based on RI data

Future land use and exposure pathways are anticipated to remain essentially the same; however, vacant apartments above the delicatessen may be occupied in the future and construction or underground utility work may be conducted at the site. Additionally, if redevelopment of the Site were to occur, surface and subsurface soil contamination could be redistributed thereby exposing future receptors to contaminants in mixed surface and subsurface soil.

Potential complete exposure pathways under future land use scenarios are the same for current site receptors and not repeated below. One of the objectives of the RI is to evaluate whether groundwater has been affected by site-related contamination. The State Classification of groundwater in the area is Class GA. Groundwater in the vicinity of the site is thought to be used for industrial purposes. Specific industrial groundwater uses are unknown at this time but will be investigated as part of the RI. Exposure pathways associated with groundwater will be evaluated based on data collected in the RI.

Because contaminant distribution and receptor behavior vary throughout the site, more than one exposure area may be considered. Exposure point concentrations (EPCs) will be determined for each COPC by exposure area in the risk assessment for use in the calculation of daily intake or dose. The EPC is the 95 percent or higher upper confidence limit (UCL) on the mean concentration or the maximum detected concentration, whichever is lower. ProUCL version 5.0.00 (EPA 2013b) or the most recent version will be used to calculate UCLs. Values for non-detects in the dataset will be determined in ProUCL, with the exception of radionuclides.

Site-specific data will be used to establish the degree of equilibrium between each parent radionuclide and its decay products in each medium sampled. For this assessment, if a radionuclide is non-detect but is detected in the background dataset, the assumed value will be the site-specific background value.

EPCs for COPCs in airborne dust will be equivalent to the EPCs for COPCs in surface soil. The intake equations for airborne dust contain scenario-specific particulate emission factors (PEFs) to convert concentrations in soil to concentrations in air.

Daily intakes will be calculated for all exposures. These daily intakes will be used in conjunction with toxicity values to provide quantitative estimates of cancer risk and noncancer effects. Exposure assumptions used in daily intake calculations will be based on information contained in EPA guidance, site-specific information, and professional judgment. These assumptions are generally 90th and 95th percentile parameters, which represent the reasonable maximum exposure (RME). The RME is the highest exposure that is reasonably expected to occur at a site. If potential risks and hazards exceed EPA target levels (i.e., cancer risk range of 1×10^{6} to 1×10^{4} or hazard index [HI] of 1), then central tendency exposures (CTEs) will be evaluated using 50th percentile exposure parameters.

The exposure assessment will identify the magnitude of actual or potential human exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. The assumptions will include information from the Standard Default Assumptions Guidance (EPA 1991), the Exposure Factors Handbook (EPA 2011b), and OSWER 9200.1-120 Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors (EPA 2014f). Site-specific information will be used where appropriate to verify or refine these assumptions. In developing the exposure assessment, CDM Smith will develop reasonable maximum estimates of exposure for both current land use conditions and potential future land use conditions at the site. The New York City Department of Environmental Protection will be consulted to develop accurate exposure estimates for the construction/utility worker scenarios.

Toxicity Assessment

The toxicity assessment will present the general toxicological properties of the selected COPCs using the most current toxicological human health effects data. Those chemicals which cannot be quantitatively evaluated due to a lack of toxicity factors will not be eliminated as COPCs on this basis. These chemicals will be qualitatively addressed for consideration in risk management decisions for the site.

Chemical toxicity values used will be obtained from a variety of toxicological sources according to a hierarchy established in the OSWER Directive 9285.7-53 (EPA 2003). The toxicity values hierarchy is as follows:

- Tier 1 – EPA's IRIS
- Tier 2 – EPA's Provisional Peer-Reviewed Toxicity Values (PPRTVs): The Office of Research and Development, National Center for Environmental Assessment (NCEA), and Superfund Health Risk Technical Support Center develop PPRTVs on a chemical-specific basis when requested by EPA's Superfund program.
- Tier 3 – Other toxicity values: Tier 3 includes additional EPA and non-EPA sources of toxicity information. Priority will be given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer-reviewed.

Toxicity values for radionuclides used will be obtained from:

- The Health Effects Assessment Summary Tables (HEAST) radionuclide slope factors (SFs) table (EPA 2001c)
- The RESRAD model

In some cases, cancer slope factors available for radionuclides include the contributions from their short-lived decay products assuming equal activity contributions (i.e., secular equilibrium) (EPA 1997). Site-specific data will be used to establish whether each parent radionuclide and its decay products are in equilibrium in each medium sampled.

COPCs are quantitatively evaluated on the basis of their noncancer and/or cancer potential. The reference dose (RfD) and reference concentration (RfC) are the toxicity values used to evaluate noncancer health hazards in humans. Inhalation unit risk (IUR) and SF are the toxicity values used to evaluate cancer health effects in humans. An SF is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime and is usually the upper 95 percent confidence limit of the slope of the dose-response curve expressed as the inverse of milligrams per kilogram per day ($[mg/kg/day]^{-1}$). An SF is used to estimate an upper-bound probability of an individual developing cancer as a result of a lifetime of exposure to a particular level of a potential carcinogen. The IUR is the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to a chemical at a concentration of 1 microgram per cubic meter ($\mu g/m^3$) in air.

EPA's Office of Radiation and Indoor Air calculates radionuclide SFs based on the unique chemical, metabolic, and radioactive properties (EPA 2001d). SFs for radionuclides are characterized as central tendency (CT) estimates of the age-averaged lifetime total radiation cancer incidence risk per unit intake or exposure. EPA has classified all radionuclides as Group A carcinogens (known human carcinogens) based on their property of emitting ionization radiation and on the extensive weight of evidence provided by epidemiological studies of radiogenic cancers in humans.

For the evaluation of noncancer effects in the risk assessment, chronic and subchronic RfDs or RfCs are used. A chronic RfD/RfC is an estimate of a daily exposure level for the human population, including sensitive sub-populations, that is likely to be without appreciable risk of deleterious effects during a lifetime. Chronic RfDs/RfCs are generally used to evaluate the potential non-cancer health effects associated with exposure periods between 6 years and a lifetime. Subchronic RfDs/RfCs aid in the characterization of potential noncancer effects associated with shorter-term exposure (i.e., less than 7 years).

3.2 Task 2 – Community Relations

CDM Smith will provide technical support to EPA during the performance of the following community involvement activities throughout the RI/FS in accordance with the EPA Superfund Community Involvement Handbook (EPA 2005b).

3.2.1 Community Interviews

Per the EPA SOW, this subtask will not be performed.

3.2.2 Community Relations Plan

CDM Smith will prepare a draft community relations plan (CRP) that presents an overview of the community's concerns. The CRP will include:

- Site background information including location, description, and history
- Community overview including a community profile, concerns, and involvement
- Community involvement objectives and planned activities, with a schedule for performance of activities
- Mailing list of contacts and interested parties
- Names and addresses of information repositories and public meeting facility locations
- List of acronyms
- Glossary

CDM Smith will submit a final CRP that reflects EPA's comments on the draft CRP.

3.2.3 Public Meeting Support

CDM Smith will perform the following activities to support two public meetings and one availability session.

- Make reservations for a meeting space, in accordance with EPA's direction
- Attend two public meetings and one availability session, and prepare draft and final meeting summaries
- Reserve a court reporter for each of the two public meetings
- Provide full-page and "four on one"-page copies of meeting transcripts, five additional copies of the transcripts, and an electronic copy of each transcript in Microsoft Word 2007 or latest version
- Provide and maintain a sign-in sheet for each public meeting and use the names on the sign-in sheet to update the site mailing list

CDM Smith will develop draft visual aids (i.e., slides and handouts) as instructed by EPA. CDM Smith will develop final visual aids incorporating all EPA comments.

3.2.4 Fact Sheet Preparation

CDM Smith will perform a technical review and finalize draft fact sheets provided by EPA for each meeting. Draft fact sheets will be six to eight pages in length, with illustrations. CDM Smith will revise, edit, finalize, and photocopy the final fact sheets with incorporation of all EPA comments. CDM Smith will prepare the mailings with address labels and deliver them to EPA, who will be responsible for mailing the fact sheets.

3.2.5 Proposed Plan Support

Per the EPA SOW, this subtask is not applicable.

3.2.6 Public Notices

As discussed during the technical scoping meeting on July 24, 2014, this subtask will be performed by EPA.

3.2.7 Information Repositories

Per the EPA SOW, this subtask is not applicable.

3.2.8 Site Mailing List

Per the EPA SOW, this subtask is not applicable.

3.2.9 Responsiveness Summary Support

CDM Smith will provide administrative and technical support for the site Responsiveness Summary. The draft document will be prepared by compiling and summarizing the public comments received during the public comment period on the Proposed Plan. CDM Smith will prepare technical responses for selected public comments, for EPA review and use in preparing formal responses.

3.3 Task 3 – Field Investigation

3.3.1 Site Reconnaissance

CDM Smith will conduct site surveys covering property boundary, utility right-of-way, and topographic information. The surveys will be performed by a surveying subcontractor who will perform the following surveys:

- Topographic survey
- Site survey including all WACC buildings, adjacent structures, and property boundaries
- Subsurface utility survey including storm/sanitary sewer delineation
- Shielding area delineation
- Geophysical underground storage tank (UST) survey to determine presence of historical USTs
- Monitoring well survey

CDM Smith will also perform site reconnaissance at the two Newtown Creek sampling areas as well as the creek sediment background sampling area.

3.3.2 Mobilization and Demobilization

CDM Smith will mobilize personnel, equipment, and materials necessary to perform the field investigation. Mobilization will be performed in phases based upon the specific type of work to be performed. CDM Smith assumes two separate mobilization events will be necessary to complete this field investigation. Initial CDM Smith mobilization activities will include a field planning meeting, an initial health and safety debriefing for project team members, siting and electrical hookup of a radiological counting laboratory/trailer, and purchase and mobilization of CDM Smith equipment and supplies. Prior to any intrusive investigations, the remaining equipment will be mobilized to the site and radiation safety awareness training will be provided to site personnel.

Demobilization activities will include removal of all equipment and facilities brought to the site by CDM Smith.

Site Access Support

Access to public areas (roads, sidewalks, etc.) and private property will be needed to execute the field investigation. EPA will be responsible for obtaining site access. CDM Smith will assist EPA with site access.

CDM Smith will provide a list of owners of properties (public and private) to be accessed during the field activities. The list will include the mailing addresses and telephone numbers of the property owners. Once EPA has established that access has been granted, sampling activities can begin. CDM

Smith will contact and coordinate with property owners, local officials and appropriate New York City agencies (for work in public areas) to schedule sampling activities.

3.3.3 Hydrogeological Assessment – Monitoring Well Installation, Development, and Testing

In order to investigate contamination in site groundwater, CDM Smith, with the support of a subcontract drilling firm, will direct the installation, development, slug testing, and down-hole geophysical survey of five monitoring wells. Locations will be selected for the monitoring wells following the completion of the initial soil boring program described in **Section 3.3.5**. Preliminary proposed locations are shown on **Figure 3-1**. Final locations will be confirmed with EPA prior to installation.

Monitoring Well Installation

Monitoring wells will be installed to screen the water table at an expected depth of 65 feet below ground surface (bgs). The proposed drilling method is hollow-stem auger (HSA) drilling with 4-inch inside diameter (I.D.) augers to allow installation of a 2-inch I.D. Schedule 40 polyvinyl chloride (PVC) monitoring well. Wells are expected to be screened from 65 to 75 feet bgs.

Split-spoon samples will be collected continuously from the surface to total depth in each well. The split-spoon samples will be logged by the onsite geologist and scanned as described in **Section 3.3.5**. Upon reaching the terminal depth, the annulus around the well screen will be backfilled with sand, which will extend 2 feet above the well screen, followed by a 4-foot bentonite chip seal, which will be allowed to hydrate before the borehole is grouted to the surface. Wells will be completed with heavy duty 6-inch diameter flush-mount curb boxes and fitted with lockable compression plugs. Well drilling and construction details will be specified in the QAPP.

Monitoring Well Development

Monitoring well development will be performed to remove silt and clay from the well and sand pack and to provide a good hydraulic connection between the well and the aquifer materials. Turbidity, pH, temperature, conductivity, and dissolved oxygen (DO) will be monitored during development. Development will continue until all parameters have stabilized (within 10 percent for successive measurements) and the water is clear. Well development procedures will be detailed in the QAPP.

Slug Testing

Monitoring wells will be slug-tested to provide a range of aquifer characteristics. Falling- and rising-head slug tests will be performed on each well using pressure transducers to monitor the water levels during each test.

Down-Hole Geophysical Testing

Each monitoring well will be logged by the subcontract driller with an array of gamma, caliper, and resistivity probes. CDM Smith will provide EPA with copies of the well logs in both hard copy and electronic formats.

Synoptic Water Level Measurements

CDM Smith will collect two rounds of synoptic water level elevation measurements to better define groundwater flow in the vicinity of the site. The water levels will be collected during both the dry (fall) and wet seasons (spring) to help define the seasonal range of groundwater elevations.

3.3.4 Monitoring Well Installation, Development and Testing

See **Section 3.3.3**.

3.3.5 Environmental Sampling

This subsection summarizes the various radiological and other field investigations that will be performed to characterize the nature and extent of contamination at the site. These include:

- Radiological background measurements
- Soil boring investigation
- Radiological building materials survey
- Sewer investigation
- Gamma exposure rate confirmation readings
- School and daycare survey
- Hazardous building materials survey
- Groundwater sampling
- Creek sediment Sampling

Radiological Background Measurements

Initial surveys will be performed to establish radiological background measurements for various media. These background surveys will be performed in un-impacted areas near but not directly adjacent to the site. For all background datasets collected, a distribution, mean, standard deviation, and 95% UCL will be determined.

Soils

Surface and subsurface soil samples will be collected, analyzed, and then used with historical background sample data for the appropriate statistical analysis. It is expected that four deep borings (as deep as 30 feet bgs) and four additional surface sampling locations (0 to 2 feet bgs) will be advanced. A total of eight samples will be collected from each zone (0-2 feet, 2-10 feet and 10-30 feet bgs) and analyzed in the field using Canberra's ISOCS as described in the Soil Boring Investigation section. Soil samples (a total of 8 per zone) will also be collected for chemical analyses to provide a range of background values for organics and inorganics in the area. Sampling summary is defined in Table 3-1.

At each soil boring location, 20 one-minute counts using a collimated 2x2-inch sodium iodide (NaI) detector will be taken at evenly spaced intervals in the background soil sample areas. Data will also be collected and analyzed in a similar manner for concrete, asphalt, and gravel surfaces. The data points will be collected at a distance of approximately 10 centimeters (cm) from surface to detector.

The rate meter(s) used for radiation dose rate confirmation surveys will also be used to determine a general area background. However, because of the numerous media and geometry combinations, the range of 6 to 10 microroentgen per hour (μR/h) established from previous surveys will be assigned as the background. The purpose of this survey is to ensure consistency between meter results for this survey and previous reports.

Sewers

Background count rate and exposure rate data will be collected from two un-impacted sewer systems. Count rates will be collected at approximately 0.3-meter (m) intervals from the top of the entry point to the bottom of the sewer. No statistical analysis will be performed for these values.

Air

No radon/thoron background data will be collected as the previous surveys have established the range of values likely to be observed.

Soil Boring Investigation

Two types of soil borings will be advanced using a direct push technology (DPT) drill rig:

- An estimated 35 shallow soil borings will be advanced to 10 feet bgs on the WACC property, at the periphery and surrounding area of the site, and along Moffat Street with the principal purpose of delineating the lateral extent of the contamination, and to confirm previously identified shallow contamination depth.

- An estimated 8 deep soil borings will be advanced to approximately 30 feet bgs within and adjacent to the WACC property to verify the vertical extent of the contamination.

Prior to performing borings, a 2x2-inch NaI scan of the area will be performed. Boring locations will be moved if, in the opinion of the project team, the lateral contamination extends beyond the initial boring location selected.

Continuous soil cores will be collected, gamma scan will be performed, lithology will be described by a CDM Smith geologist, and samples collected at approximately 2-foot intervals. All soil cores will be scanned in the field using a 2x2 NaI probe to verify the count rates have reduced to background rates, suggesting the limit of contamination has been reached. Soil samples will be analyzed in the field using Canberra's ISOCS as described in the subsequent paragraph . Additional borings (lateral extent) or deeper cores (vertical extent) will be collected where analysis indicates the Th-232 concentrations exceed the 95% UCL for background. For soil boring locations where refusal is encountered, a down-hole gamma reading will be obtained at the bottom of the borehole to verify the gamma radiation levels at depth. Any soil borings advanced through the installed shielding shall be backfilled with a cement bentonite grout, which will be allowed to settle prior to restoration of the lead shielding and concrete floor.

The ISOCS is a field deployable High Purity Germanium (HPGe) gamma spectroscopy system, capable of identifying gamma emitting radionuclides at a detection level comparable to HPGe laboratory analysis systems. The ISOCS will be used by CDM Smith to perform field analysis and quantification of Th-232 and Ra-226 in sample borings collected during field tasks. The Ra-226 values will be quantitated from the 186 kilo electron volt (keV) peak as well as several peaks (295.2 keV, 351.9 keV, and 609.3 keV) from the radioactive progeny of Ra-226. The Th-232 will be quantitatively assessed using the actinium 228 peaks (,911.1 keV, and 969.1 keV) and other peaks (338.32 keV and 72.17 keV) from the thorium decay chain progeny.

Ten percent of the soil samples analyzed in the field (randomly selected) will be shipped to an offsite subcontract laboratory for confirmation of the field analyses. Two chemistry samples will also be collected from select soil boring locations within the WACC area (20 locations to be selected during the field investigation) in order to characterize the nature and extent of other contaminants on the site and for use in the HHRA. **Table 3-1** summarizes the proposed soil samples to be collected and analyzed. **Figure 3-2** shows the proposed soil boring locations.

Radiological Building Materials Survey

A radiological survey of the building materials will be performed to determine if any process or effluent radioactive materials have become embedded in the building materials. The characterization survey of the buildings and building materials will follow the guidance provided in MARSSIM Section 5.2 and 5.3. Note that these types of surveys do not typically involve a statistical approach as used in the Final Status Survey guidelines within MARSSIM. An initial wall will be scanned for alpha and beta radiation using gas proportional detectors and/or dual phosphorous scintillation detectors with the objective of identifying locations with elevated surface/near-surface count rates. This survey will be problematic in some areas of the buildings due to the higher levels of radioactivity that exist below the concrete surfaces. For those locations, professional judgment will be used to select media to sample. In locations where new flooring has been installed, no floor scans will be performed.

The exterior walls up to 6 feet above the ground surface will be scanned. The rooftops will also be scanned and special targeted surveys will be performed for any air intake units, including the filter media.

Where suspect locations are identified, a 5-cm core or chip sample of the media will be collected. Repairs to these sample locations will be made after collection of the sample.

The following buildings and sub-areas will be surveyed:

- The basement of the Jarabacoa Deli at 1125 Irving Street (Lot 46)
- The Primo Auto Body Repair Shops at 1127 Irving Street and 1129 Irving Street (Lot 44 and part of Lot 42)
- The Terra Nova – Construction Contractor Shop at 1129 Irving Street (part of Lot 42)
- The Arctic Glacier Losquadro, Inc. Warehouse at 1133-1139 Irving Street (Lot 33)

Sewer Investigation

A sewer investigation will be performed within and adjacent to the combined sewer system in the area around WACC that may have been impacted by the historic discharge of radiological material. This investigation will involve several components, including:

- Fiberscope mapping
- In-sewer dose rate measurements
- sewer building materials sampling
- Soil borings

Sewer investigation activities will require approval and cooperation from New York City to open manholes and place monitoring equipment into the sewer infrastructure. CDM Smith will provided technical support to EPA to gain access to sewers.

Fiberscope Mapping

An initial mapping of the sewer system will be performed by a subcontractor using a fiberscope and camera to identify locations where significant cracks and leaks may exist. **Figure3- 3** shows the lines to be examined. The intent is to map the lines on Irving Avenue, Cooper Street, Moffat Street and Halsey Street (in the direction of sewer flow); the adjoining streets will also be scoped to limits of the second manhole on each road.

In-Sewer Dose Rate Measurements

One of the more significant concerns with existing data is the existence of substantial "in-sewer" gamma dose rates with no corresponding high activity soil/debris in or adjacent to sewer. To confirm the previous survey exposure rate data, in-sewer gamma dose rates will be performed at access points along the highlighted sewer systems and the survey exposure rates observed will be compared to the previous survey data (refer to **Figure 3-3**; manhole locations are estimated on the figure and will be finalized following completion of the survey task). Similar to the fiberscope survey, the intent is to scan the manholes on Irving Avenue, Cooper Street, and Moffat Street. In addition, manholes on the adjoining streets will be scanned, likely limited to the first or second manhole on each road based on the survey exposure rate data. If elevated readings continue past the first two manholes, additional sewer scans will be performed.

Sewer Soil Borings

If the fiberscope mapping and in-sewer dose rate measurements indicate contamination likely exists outside of the sewer system, further investigatory work around and in the sewers will be performed. Soil borings will be performed laterally as close as possible to and to a depth at least 1 meter below the sewer line. Sewer soil boring locations will be determined as field investigation results are evaluated. In addition, these borings will determine if material from the site may have been used as backfill during sewer installation. It is assumed that 10 sewer soil borings will be advanced to a depth of 15 feet bgs. Sewer soil borings will be completed in a manner similar to the soil borings described in the Soil Boring Investigation activity section.

Sewer Materials

Samples of potentially impacted sewer construction materials (concrete, mortar, or bricks) will be collected from manholes in an attempt to verify the source of gamma exposure. Samples will be analyzed in the field using the ISOCS. It is assumed that up to 5 material samples will be collected.

Gamma Exposure Rate Confirmation Readings

Locations will be selected for further surveying to aid in the final dose/risk assessment. It is believed that the current gamma dataset is sufficient for data analysis, but the myriad of existing dose rate values should be filtered so that the most accurate data are used in the risk assessment evaluation. In addition, if, as suspected, the extent of contamination is laterally greater than previously determined, additional data points will aid in the final risk assessment. It is assumed that approximately 50 gamma exposure rate measurements will be collected from the following locations:

- Previously identified hotspots
- Auto body shop areas at 0.15 m and 1 m from the floor
- Office areas at 1 m from the floor
- Deli at 1 m from the floor
- Warehouse areas at 1 m from the floor
- Irving Avenue, both south and north sides, at 1 m from the surface
- Backyard/rail spur at 1 m from the surface
- Manholes at 0.5 m from the surface

School and Daycare Survey

Per EPA direction during the technical scoping meeting held on July 24, 2014, supplemental surveys will be performed at the P.S./I.S. 384 Frances E. Carter School and Daycare Center for the purpose of validating and augmenting previously collected survey data. The samples to be collected and surveys to be performed include the following:

Radon Evaluations

A visual inspection of the basements and crawl spaces will be performed for the purpose of identifying locations where radon/thoron gas may be entering the buildings. Suspect locations will then be monitored using electrometers such as the RAD7 Portable Radiation Monitor or equivalent device to verify if these locations are radon/thoron gas entry points to the respective buildings.

Short-term and long-term radon measurements will be performed at the school and daycare facilities in accordance with the EPA Radon Measurement in Schools guidance document, dated July 1993 (EPA 1993). Radon measurements will be performed in the basements and/or first floors of the two facilities using alpha track detectors (ATDs). The ATDs will be placed in selected frequently occupied rooms in contact with the ground. Six ATDs (3 standard and 3 thoron filtered) will be placed at each location and retrieved after 3 months, 6 months, and 1 year. It is assumed that radon measurements will be performed at 5 locations in the school and 2 locations in the daycare.

Dose Rate Evaluations

Dose rate mapping using a pressurized ion chamber (PIC) will be performed in the basement areas and the outside grounds areas of the school and daycare. The mapping will be performed in 10-m intervals at a height of 1 m above ground surface.

Soil Borings

It is assumed that 10 shallow soil borings will be installed up to 10 feet bgs adjacent to the buildings to evaluate the presence of any tailings or radiologically contaminated soil. Soil borings will be completed and soil cores will be scanned and samples collected and analyzed for Th-232 and Ra-226 using the ISOCS as described in the soil boring investigation activity section.

Hazardous Building Material Survey

CDM Smith will procure a subcontractor to perform a hazardous building material survey for the properties that make up the WACC. The survey will include an initial inspection to determine the likely presence of hazardous building materials including asbestos-containing material (ACM), lead paints, mercury, and polychlorinated biphenyls (PCBs). Following the initial survey, the subcontractor will collect samples as indicated by the initial survey to help determine disposal costs of the building materials if necessary.

Groundwater Sampling

CDM Smith will collect two rounds of groundwater samples from the five site monitoring wells to coincide with the collection of synoptic water level measurements described in **Section 3.3.3**. Wells will be sampled using low-flow purge and sampling techniques and will be sampled for Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), PCBs, pesticides, Target Analyte List (TAL) metals (both filtered and unfiltered), and gamma spectroscopy.

Creek Sediment Sampling

CDM Smith will collect sediment samples from the two potential Newtown Creek discharge areas as well as a background locations in Coney Island creek to investigate the presence of site related contaminants in the creek sediments. Sampling will include:

- Collection of 5 ten-foot sediment cores via barge-mounted vibracore from each of the two most upstream branches of Newtown Creek (the east branch and English Kills; see Figures 3-4 and 3-5)
- Collection of 2 ten-foot sediment cores and 8 shallow (0-0.5 ft interval) grab samples via barge-mounted vibracore from Coney Island Creek, the proposed background location located approximately 9 miles from the site (see Figure 3-6)
- Samples will be collected from the cores from 11 intervals including 0-0.5 ft, 0.5-1.0 ft, and every 1-foot interval thereafter.

All core/grab samples will be analyzed for gamma spectroscopy, isotopic uranium and isotopic thorium.

Radiological Sample Data Collection, Recording and Analysis
This subsection describes the instruments to be used on site for the radiological investigation.

Hand-held direct-reading instruments will have read-outs either directly recorded on data sheets or tablets, or logged data will be downloaded to a spreadsheet or other program for data evaluation and presentation. Surface wipes and air samples will counted on site using an alpha-beta dual phosphor detector or instrument with equivalent detection capability. Soil boring, surface soil, sewer construction material, and building material samples will be analyzed for Th-232 and Ra-226 in the field using Canberra's ISOCS. Ten percent of those samples will be randomly selected and sent for offsite analysis at an independent laboratory as summarized in **Table 3-1**.

Radiological Controls
The project HASP will contain the details of the radiological safety program. The following provides an overview of the processes and controls:

- All personnel potentially in contact with radiological contaminants will receive radiation safety awareness training.
- Dose rates will initially be established for each work area and, where appropriate, time and distance controls will be implemented to reduce total exposure.
- During groundwater collection or material extraction activities, periodic surveys of equipment and extracted material will be performed to identify significantly higher than normal radioactivity levels. The senior health physicist at the job site will make appropriate adjustments to any radiological controls to limit personnel exposure and potential spread of contaminants.
- All materials will be scanned and wipe surveyed to identify any equipment or materials that may exceed radiological release limits described in the HASP. Those materials/equipment identified as contaminated will either be cleaned or disposed of as radiologically contaminated IDW.
- During intrusive work in areas with known high concentrations of thorium (principally the site area bounded by Cooper Street, Irving Avenue, and the railroad spur), air samples will collected to verify personnel air intakes will limit the concomitant dose to less than 100 millirem (mrem) for the year.
- Personal protective equipment (PPE) will be assigned and controlled as specified in the HASP.
- IDW will be maintained in secured containers, labeled, monitored, and segregated from personnel gathering or work areas if the senior health physician determines the container external dose rates will result in unnecessary exposure by project or site personnel.

3.3.6 Ecological Characterization

As discussed during the July 24, 2014 technical scoping meeting, an ecological characterization will not be performed, as limited receptors exist within the vicinity of the site.

3.3.7 Geotechnical Survey

As directed by EPA, this subtask is not applicable.

3.3.8 Investigation Derived Waste Characterization and Disposal

Drill cuttings and water from drilling operations will be contained at the drilling location and transported by the drilling subcontractor to a central IDW storage area. Liquid wastes will be transferred to a 5,000-gallon Baker tank and drill cuttings will be contained in 55-gallon drums or roll-off containers for subsequent sampling, characterization, and disposal by CDM Smith's IDW subcontractor. Waste will be characterized for both hazardous and radiological parameters.

3.4 Task 4 – Sample Analysis

Section 3.3 and **Table 3-1** summarize the field sampling program and analyses for each sample.

3.4.1 Innovative Methods/Field Screening Sample Analysis

As directed by EPA, this subtask is not applicable.

CDM Smith will analyze soil, sediment, and building material samples for Th-232 and Ra-226 in the field using Canberra's ISOCS as described in **Section 3.3.5**, and all associated costs for field analysis are included under Task 3. **Table 3-1** summarizes the assumed number of samples to be analyzed in the field.

3.4.2 Analytical Services Provided Via CLP or DESA

As discussed in the technical scoping meeting on July 24, 2014, CLP laboratories cannot accept potentially radiologically impacted materials, and the Division of Environmental Science and Assessment (DESA) laboratory has no way of determining whether the samples have been impacted. Therefore, all samples will be sent to a subcontract laboratory.

3.4.3 Non-Routine and Sub-Contract Laboratory Analytical Services

All soil, groundwater, and building material samples will be shipped to a subcontract laboratory for routine analytical service (RAS) (chemical) and non-RAS (radiological) analyses. The number of samples to be analyzed by a subcontract laboratory and analytical parameters are defined in **Table 3-1**. The analytical methods, detection levels, holding times, parameters, field sample preservation, and QC samples will be provided in the QAPP.

In addition, 42 radon/thoron measurements will be performed by a subcontract laboratory using ATDs.

3.5 Task 5 – Analytical Support and Data Validation

3.5.1 Collect, Prepare and Ship Samples

Sample preparation and shipment is included under Task 3.

3.5.2 Sample Management

Samples analyzed by the subcontract laboratory will be coordinated by the ASC. All analytical data packages from the subcontract laboratory will be sent directly to CDM Smith for data validation. If requested, CDM Smith will send these validated data packages to EPA for QA review purposes. The data will be delivered in a format conducive to database input. CDM Smith will provide the subcontract laboratory with the required EPA Region 2 EDD format.

3.5.3 Data Validation

All subcontract laboratory data (chemical and radiological) will be validated by CDM Smith and/or the project specific subcontractor (Greenwich Environmental). All chemical data will be validated in accordance with the most recent EPA Region 2 data validation protocols and radiological data will be validated in accordance with the Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) (EPA 2004b). The validation will determine the usability of the data. The data validation reports will be submitted to EPA after all data have been validated. Data validation will verify that the analytical results were obtained following the protocols specified in the QAPP and are of sufficient quality to be relied upon to prepare the RI report, HHRA report, FFS report, and to support a ROD.

3.6 Task 6 – Data Evaluation

This task includes efforts related to the compilation of analytical and field data. All validated data generated during this RI will be entered into CDM Smith's EQuIS™ database to meet EPA Region 2 EDD requirements. Tables, figures, and maps will be generated from the data to support preparation of the RI report, the HHRA report, and the FFS report. The data will be reviewed and carefully evaluated to identify the nature and extent of site-related contamination.

3.6.1 Data Usability Evaluation

CDM Smith will evaluate the usability of the data, including any uncertainties associated with the data. The data validation reports will be reviewed and field sampling techniques, laboratory analytical methods and techniques, and data validation will all be considered in evaluating the usability of the data. The usability of the data will be evaluated using the DQOs as defined in the QAPP. Any rejected data will be discussed in the data evaluation report (DER).

3.6.2 Data Reduction, Tabulation and Evaluation

This subtask will include reduction, tabulation, and evaluation of the data collected during the RI field activities. This subtask includes the following activities.

<u>Database Management</u>

Data will be stored in EQuIS™ and can be exported as required to support the analysis and presentation of data using gINT, Microsoft Excel, ArcMAP GIS software, AutoCAD, Surfer, and other applications. Database management activities, including upload of field sample information, will be performed for the following samples to be collected during the RI field program (includes field quality control samples):

- 494 samples processed in the field using the ISOCS

- 52 laboratory samples for gamma spectroscopy
- 70 soil samples for TCL VOCs, SVOCs, PCBs, pesticides, and TAL metals
- 11 groundwater samples for TCL VOCs, SVOCs, PCBs, pesticides, TAL metals, and gamma spectroscopy
- 46 samples for radon/thoron
- 154 sediment samples for gamma spectroscopy and isotopic radium/ thorium

All data entry will be checked for QC throughout the multiple phases of the project. Tables that compare analytical results with both state and federal ARARs will be prepared and evaluated.

Well Construction and Soil Boring Logs

Lithologic data from boring and well installation and well construction information will be used with gINT software to generate soil boring logs, well construction diagrams, and cross sections. At the conclusion of the project, lithologic and well construction data will be transferred to EQuIS™. CDM Smith will generate the following data logs:

- 55 boring logs for the shallow and deep borings
- 5 monitoring well logs
- 12 sediment core logs

Geophysical logging data will be managed using WellCAD software. The subcontractor will provide raw instrument data files and WellCAD files. If necessary, data from some logs, such as natural gamma, will be exported from WellCAD and imported into gINT for use in cross section and boring logs. Borehole geophysical data will not be transferred to the EQuIS™ database. WellCAD and raw instrument data files can be provided to EPA.

Data from Previous Investigations

CDM Smith will input select data collected during previous investigations into the site database if the data are provided in usable electronic deliverables. Data collected during previous investigations will be utilized in the RI to assist with determination of the nature and extent of contamination and in the FFS to develop and evaluate potential remedial alternatives.

GIS and Figures

CDM Smith will create a GIS (including a basemap) in order to facilitate spatial analysis of the data and to generate figures for reports and presentations. As samples are collected and wells are installed, the locations will be registered in the GIS. Current and select historical analytical results will be added, creating functionality that will be used to support data visualizations appropriate to complement the RI report, FFS report, and HHRA.

Electronic Data Deliverable

CDM Smith will prepare an EDD in accordance with EPA Region 2 EDD requirements. The EDD will include the analytical and geologic data generated during the course of the RI as well as the GIS basemap.

3.6.3 Modeling (Optional)

Groundwater modeling is not required by EPA at this time. If during the course of this RI/FS EPA determines performance of this subtask is necessary, CDM Smith will evaluate the existing data collected under the field investigation and make an assessment of the need for modeling to complete an accurate characterization of the nature, extent, distribution and movement of site contamination. This evaluation is expected to cover the historical distribution and movement of site contamination (forensic modeling) to help identify potential source areas, utilizing the results of the chemical fingerprinting analysis. CDM Smith will provide a technical memorandum summarizing the results of this evaluation and its recommendations concerning performance of modeling for this RI/FS. Based on its review of this technical memorandum, EPA will determine whether modeling will be conducted for this RI/FS, and will direct the contractor to perform a modeling effort as required.

3.6.4 Data Evaluation Summary Report

In lieu of a formal DER, CDM Smith will present a summary of the RI results to EPA at a meeting, allowing for discussion of the results and determination of the path forward to completing the RI report or deciding if any Phase II investigation is necessary.

3.7 Task 7 – Assessment of Risk

The objective of the HHRA is to provide an evaluation of potential threats to human health that could occur from exposure to contaminants originating from the site in the absence of any remedial action. The risk assessment also provides the basis for determining whether remedial action is necessary and the justification for performing remedial actions.

3.7.1 Baseline Human Health Risk Assessment

Upon EPA's approval of the PAR, CDM Smith will characterize risks associated with the site and initiate preparation of the draft baseline HHRA report as described below. The baseline HHRA will be prepared and presented in accordance with EPA Risk Assessment Guidance for Superfund (EPA 1989, 2001a, 2004a, 2009, 2011b, 2014x, 2014y) and EPA Guidance for Radiation Risk Assessment at CERCLA sites (EPA 2014e).

Draft Human Health Risk Assessment Report

Risk Characterization

In this section of the risk assessment, toxicity and exposure assessments will be integrated into quantitative and qualitative expressions of cancer risk and noncancer health hazards. The estimates of risk and hazard will be presented numerically in spreadsheets contained in an appendix. For radionuclides, risk calculations will include output from the RESRAD model executed in risk mode.

Cancer risks are estimated as the incremental probability of an individual to develop cancer over a lifetime as a result of exposure to a potential carcinogen. The upper-bound excess lifetime cancer risk is estimated by multiplying the lifetime exposure estimated in the exposure assessment by the cancer SF or IUR for each COPC.

The potential for noncancer health effects is evaluated by comparing an exposure level or concentration over a specified time period with an RfD or RfC derived for a similar exposure period. This ratio of exposure to toxicity is referred to as a hazard quotient (HQ). The HI is the sum of the HQs from individual chemicals and exposure routes. If the HI exceeds unity (1), HQs for individual COPCs with similar toxicological effects or mechanism of action may be summed to yield a target organ/effect-specific HI (EPA 1989). The target organ/effect-specific HI is calculated by summing HQs for chemicals with similar toxicological effects (e.g., developmental toxicity) or target organs (e.g., liver). If the sum of all HIs is less than 1, no target organ/effect-specific HIs are calculated because they would not exceed 1. The HI assumes that there is a level of exposure below which it is unlikely even for sensitive populations to experience adverse health effects. However, this value should not be interpreted as a probability; generally, the greater the HI is above unity, the greater the level of concern.

Cancer risks and noncancer HI values will be combined across chemicals and exposure pathways as appropriate. In general, EPA recommends a target value or risk range (i.e., cancer risk range of 1×10^{-6} to 1×10^{-4} or an HI of 1) as threshold values for potential human health impacts. The results presented in the spreadsheet calculations will be compared to these target levels and discussed. Exposure pathways and COPCs that are risk drivers will be identified.

Characterization of the potential risks associated with the site provides the EPA risk manager with a basis for determining whether additional response action is necessary at the site and a basis for determining residual chemical levels that are adequately protective of human health.

Identification of Uncertainties

In any risk assessment, estimates of potential cancer risks and non-cancer health hazards have numerous associated uncertainties. The primary areas of uncertainty are associated with every step of a risk assessment (data evaluation, exposure assessment, toxicity assessment, and risk characterization). Uncertainties in these steps will be discussed qualitatively in the report, specifically uncertainties in environmental data, exposure parameter assumptions, toxicological data, and risk characterization. A sensitivity analysis will be conducted for key assumptions that affect risk estimates for radionuclides (e.g., source concentration, exposure time, shielding factors).

All data for non-radionuclides will be presented in RAGS Part D format (EPA 2001a). Data for radionuclides will include output from RESRAD models which includes all assumptions input into the model and results of model calculations as model output. The draft HHRA report will provide adequate detail of the risk assessment activities and will be presented so that individuals unfamiliar with risk assessment can easily follow the procedures.

An evaluation of risk associated with exposure to background radionuclides and metals will be performed to provide context for site risks.

Final Human Health Risk Assessment Report

The final HHRA report will incorporate EPA review comments.

3.7.2 Ecological Risk Assessment

The Wolff-Alport site is located in an industrial site area with no environmentally sensitive areas (e.g., wetlands) and limited habitats for ecological receptors; thus, exposures for ecological receptors at the site are likely insignificant. For this reason, and because combined sewer overflow (CSO) discharges at the site may contain the thorium waste from monazite sand processing, the screening level ecological risk assessment (SLERA) proposed to be conducted for this site will focus on risks to ecological receptors exposed to the site-related CSO discharges in Newtown Creek.

Considering the limited exposure pathways and exposure potential for ecological receptors, the SLERA will be conducted using a focused, streamlined approach resulting in a Technical Memorandum (TM), rather than a SLERA report. The TM will present and interpret the results of the screening level analyses where maximum detected concentrations of radiological contaminants are compared to radiological screening levels as described below.

The SLERA TM will compare analytical data from 10 surface sediment samples collected from five locations at each of the two CSOs. In addition, the SLERA TM will also evaluate the radionuclide concentrations measured in ten background sediment samples. These data will be compared to their respective radionuclide ecological screening levels (ESLs) listed in the table below. These ESLs were established by CDM Smith for US Department of Energy (DOE) for Portsmouth Gaseous Diffusion Plant, Piketon Ohio. These radionuclide ESLs for sediment are the chemical-specific No Further Action (NFA) levels derived from RESRAD; these are biota concentration guide levels associated with a no effect dose of 0.1 rad/day for aquatic organisms.

NFA Sediment Values for Radionuclides

Radionuclide	NFA[1] (pCi/g sediment)	Limiting Organism
Thorium-230	1.04E+04	Riparian Animal
Uranium-234	5.27E+03	Riparian Animal
Uranium-235	3.73E+03	Riparian Animal
Uranium-238	2.49E+03	Riparian Animal

[1]BCG from RESRAD, Aquatic, Level 2, Version 1.5 created November 18, 2009

RESRAD assumptions include: Area Factor = 1; Dose Limit = 0.1 rad/day for aquatic animals and riparian animals; media = sediment

pCi/g = picocuries per gram

Radionuclide ESLs for the radionuclides that are not included in the table, specifically Thorium-228 and -232, and Radium-226, will be developed using DOE's RESidual RADioactive (RESRAD) model.

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3.8 Task 8 – Treatability Study and Pilot Testing

Applicable treatment technologies that may be suitable for the site will be identified to determine if there is a need to conduct treatability studies.

3.8.1 Literature Search

CDM Smith will research viable technologies that may be applicable to the COPCs and the site conditions encountered. Upon completion of the literature search, CDM Smith will provide a technical memorandum to the EPA RPM that summarizes the results. As part of this document, CDM Smith will submit a plan that recommends performance of a treatability study and identifies the types and specific goals of the study. The treatability study will be designed to determine the suitability of remedial technologies to site-specific conditions and contamination. If directed by EPA, CDM Smith will prepare an addendum to the RI/FS work plan for the treatability study, as described in **Section 3.8.2**.

3.8.2 Treatability Study Work Plan Addendum (Optional)

If requested by EPA, CDM Smith will perform the following:

- Prepare a draft addendum to the RI/FS work plan that describes the approach for performance of the treatability study
- Participate in negotiations to discuss the final technical approach and costs required to accomplish the treatability study requirements
- Prepare a final work plan addendum and supplemental budget that incorporate the agreements reached during the negotiations

The treatability study work plan addendum will describe the treatment process and how the proposed technology or vendor (if proprietary) will meet the performance standards for the site. The work plan addendum will address how the proposed technology or vendor will meet all discharge or disposal requirements for treated material, air, water, and expected effluents. The proposed treatment and disposal of all material generated during the treatability study will be addressed.

The treatability study work plan addendum will describe the technology to be tested, test objectives, test equipment or systems, experimental procedures, treatability conditions to be tested, measurements of performance, analytical methods, data management and analysis, health and safety procedures, and residual waste management. The DQOs for the treatability study will also be documented. If pilot-scale treatability studies are to be performed, the treatability study work plan addendum will also describe pilot plant installation and startup, pilot plant operation and maintenance procedures, and operating conditions to be tested. If testing is to be performed off site, permitting requirements will be addressed. A schedule for performing the treatability study will be included with specific durations and dates, when available, for each task and subtask, including anticipated EPA review periods. The schedule will also include key milestones for which completion dates will be specified. Such milestones include procurement of subcontractors, sample collection, sample analysis, and preparation of the treatability study report.

3.8.3 Conduct Treatability Studies (Optional)

If requested by EPA, CDM Smith will conduct the treatability study in accordance with the approved treatability study addendum to the RI/FS work plan, QAPP, and HASP to determine whether the remediation technology or vendor of the technology can achieve the performance standards. The following activities are to be performed, when applicable, as part of the performance of the treatability study and pilot testing:

- Procurement of test facility and equipment – CDM Smith will procure the test facility and equipment necessary to execute the tests.
- Procurement of subcontractors – CDM Smith will procure subcontractors as necessary for pilot test/treatability study performance.
- Test and operate equipment – CDM Smith will test the equipment to ensure proper operation and will operate or oversee operation of the equipment during the testing.
- Retrieve samples for testing – CDM Smith will obtain samples for testing as specified in the treatability study work plan.
- Perform laboratory analysis – CDM Smith will establish a field laboratory to facilitate fast turnaround of test samples, if economically and technically feasible. If necessary, CDM Smith will procure outside laboratory services to analyze the test samples.
- Characterize and dispose of residual wastes.

3.8.4 Treatability Study Evaluation Report (Optional)

If a treatability study is performed, CDM Smith will prepare and submit a treatability study evaluation report that describes the performance of the technology. The treatability study results will be used to compare the performance of the technology or vendor to the performance standards established for the site. The report will also evaluate the treatment technology's effectiveness, implementability, cost, and final results compared with the predicted results. In addition, the report will evaluate full-scale application of the technology, including a sensitivity analysis that identifies the key parameters affecting full-scale operation.

3.9 Task 9 – Remedial Investigation Report

CDM Smith will develop and submit an RI report that accurately establishes site characteristics including the identification of contaminated media, definition of the extent of contamination in site media, and delineation of the physical boundaries of contamination. CDM Smith will obtain detailed sampling data to identify key contaminants and determine the movement and extent of contamination in the environment. Key contaminants will be identified in the report and will be selected based on toxicity, persistence, and mobility in the environment.

3.9.1 Draft Remedial Investigation Report

A draft RI report will be prepared in accordance with the format described in EPA guidance documents such as the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA

(EPA 1988). A draft outline of the report, adapted from the 1988 guidance, is shown in **Table 3-2**. This outline should be considered a draft and subject to revision based on the data obtained. EPA's SOW for this WA provides a detailed description of the types of information, maps, and figures to be included in the RI report. CDM Smith will incorporate such information to the fullest extent practicable.

Upon completion, the draft RI report will be submitted for review by a CDM Smith technical review committee (TRC), followed by a QA review. It will then be submitted to EPA, and other city, state, and federal agencies, as directed by EPA, for formal review and comment.

3.9.2 Final Remedial Investigation Report

Upon receipt of all EPA and other federal and state written comments, CDM Smith will develop responses to comments and revise the RI report prior to submittal to EPA. When EPA determines that the report is acceptable, the report will be deemed the final RI report.

3.10 Task 10 – Remedial Alternative Screening

This task covers activities for the development of appropriate remedial alternatives that will undergo full evaluation. A range of alternatives will be considered, including innovative treatment technologies, consistent with regulations outlined in the NCP, 40 CFR Part 300, and the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1998) or latest version. CDM Smith will use relevant and appropriate portions of 10 CFR 20 Subpart E, the Uranium Mill Tailings Radiation Control Act (UMTRCA), 40 CFR 192, and EPA guidance to ensure protection of human health and the environment from radiological contamination. Radon from tailings piles and contaminated soils that are difficult to access will be left in place if it is determined that they pose no significant risk of future exposure.

It is evident from previous investigations that the soil, sewer sediment, and buildings at the site are contaminated. Site groundwater has not been adequately investigated, and therefore it is currently unknown whether groundwater contamination exists at the site. Investigations to be performed as part of the RI will provide the necessary information to determine whether groundwater needs to be evaluated. Therefore, it is assumed for planning purposes that CDM Smith will be required to develop remedial alternatives for multiple media at the site including soil, sediment from sewers and manholes, buildings, and groundwater.

The RI proposed within this work plan will incorporate information presented from previous investigations and the interim remedial action (IRA) performed to develop a more detailed and updated understanding of site conditions. Once existing data and data collected during the RI and IRA are evaluated, preliminary remedial action objectives (RAOs) will be refined and developed or eliminated as appropriate. Based on the established remedial response objectives and the results of the risk assessment (Task 7), the general response actions will be established, and remedial technologies will be identified and screened according to the EPA-recommended procedures (EPA 1988). Based on the results of the technology screening, a range of alternatives will be developed that considers both standard and innovative remedial technologies. The alternatives will be screened qualitatively against three criteria: effectiveness, implementability, and relative cost in accordance with EPA guidance document EPA/540/G-89/004, Section 4.2.5. A brief description of these criteria is provided below.

Effectiveness – The evaluation focuses on the ability of each alternative to effectively protect human health and the environment by reducing toxicity, mobility, or volume of contaminants. This criterion also examines how proven and reliable the process is with respect to meeting cleanup guidelines and the time required for the remedial action to achieve the desired result.

Implementability – The evaluation encompasses technical feasibility, administrative feasibility, and availability of necessary remedial materials, treatment requirements, waste management, equipment, work force, and relative ease or difficulty in achieving the operation and maintenance requirements.

Cost – The cost criterion includes relative capital costs for materials and operations and maintenance rather than detailed cost estimates. The cost analysis is based on engineering judgment, and each technology is evaluated as to whether costs are high, moderate, or low by comparison to costs of similar remedial alternatives.

The screening evaluation will generally focus on the effectiveness criterion, with less emphasis on the implementability and cost criteria. Technologies passing the screening process are those that are expected to achieve the RAOs for the site, either alone or in combination with others. Technologies that are clearly not suited at the site are eliminated.

The following alternatives have been identified for the potentially affected media at the site and may be selected as representative technologies in the FS if they are deemed appropriate for radionuclide-contaminated sites.

Soil

- No further action
- Institutional and engineering controls
- Excavation and offsite disposal
- Excavation, treatment, and offsite disposal

Sewers /Sediment

- No further action
- Institutional and engineering controls
- Removal and offsite disposal
- Removal, treatment, and offsite disposal

Buildings

- No further action
- Institutional and engineering controls

- Decontamination and restoration
- Dismantlement and disposal of debris
- Decontamination, dismantlement, and disposal of debris

Groundwater

- No further action
- Institutional and engineering controls
- Containment (slurry walls and in situ grouting)
- Removal of concentrated source material and groundwater extraction, treatment, and discharge

3.10.1 Technical Memorandum

CDM Smith will prepare a draft remedial technology screening memorandum for the FS that will document all of the analyses and evaluations described above. This draft memorandum will be submitted to EPA for formal review and comment and will include the following topics.

- **Establish RAOs** – Based on existing and new information gathered at the site, CDM Smith will identify site-specific RAOs that should be developed to protect human health and the environment. The objectives will specify the contaminant(s) and media of concern, the exposure route(s), and an acceptable range of contaminant levels for each exposure route (i.e., PRGs).
- **Establish General Response Actions** – CDM Smith will develop general response actions that might satisfy the RAOs for each medium of concern by defining containment, treatment, excavation, pumping, or other actions, singly or in combination. The response actions will take into account requirements for protectiveness as identified in the RAOs and the chemical and physical characteristics of the site.
- **Identify and Screen Applicable Remedial Technologies** – CDM Smith will identify and screen technologies based on the general response actions. Hazardous waste treatment technologies will be identified and screened to ensure that only those technologies applicable to the contaminants present, their physical matrix, and other site characteristics will be considered. This screening will be based primarily on a technology's ability to address the contaminants at the site effectively, but will also take into account the technology's implementability and cost. CDM Smith will select representative process options, as appropriate, to carry forward into alternative development and will identify the need for treatability testing for those technologies that are probable candidates for consideration during the detailed analysis.
- **Develop Remedial Alternatives in Accordance with the NCP** – Subsequent to the screening of the applicable remedial technologies and process options, CDM Smith will develop remedial action alternatives by combining the retained remedial technologies and process options.

Remedial alternatives are developed from either stand-alone process options or combinations of the retained process options.

- **Screen Remedial Alternatives for Effectiveness, Implementability and Cost** – CDM Smith will screen alternatives to identify the potential technologies or process options that will be combined into medium-specific or site-wide alternatives. The developed alternatives will be defined with respect to size and configuration of the representative process options, time for remediation, rates of flow or treatment, spatial requirements, distances for disposal, required permits, imposed limitations, and other factors necessary to evaluate the alternatives. If many distinct, viable options are available and developed, CDM Smith will screen the alternatives undergoing detailed analysis to provide the most promising process options.

The technical evaluations completed as part of this task will be summarized and presented to EPA in a technical meeting.

3.10.2 Final Technical Memorandum

In accordance with the WA, this subtask is not applicable. EPA's review comments on the draft technical memorandum will be incorporated into the draft FFS report under **Section 3.12.1**.

3.11 Task 11 – Remedial Alternatives Evaluation

As discussed during the technical scoping meeting on July 24, 2014, the efforts associated with assessment of individual alternatives against each of the nine current evaluation criteria will be performed under Task 12 as described in **Section 3.12.1**. The nine criteria are: (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness; (4) reduction of toxicity, mobility, or volume; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state Acceptance; and (9) community acceptance. The evaluation criteria for the remedial alternatives are detailed in **Table 3-3**.

A comparative analysis of all alternatives will be performed to evaluate the relative benefits and drawbacks of each according to the same criteria. A preferred remedial alternative will be recommended based upon the results of the comparative analysis. The comparative analysis will be developed as part of the draft FFS report as described in **Section 3.12.1**.

3.12 Task 12 – Feasibility Study Report

3.12.1 Draft Focused Feasibility Study Report

The draft FFS report will be prepared to: (1) summarize the activities performed; (2) present the results and associated conclusions for Tasks 1 through 10; and (3) incorporate EPA's comments on the technical memorandum prepared under Task 10. The FFS report will be prepared and presented in general accordance with the format specified in the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988). The FFS report format is shown in **Table 3-4**.

The FFS report will consist of an executive summary and five sections. The executive summary will be a brief overview of the FFS and the analysis underlying the remedial actions that were evaluated. The five sections will be as follows:

- Introduction, Site Background and Summary of the Remedial Investigation
- Development of RAOs and Screening of Technologies
- Development and Initial Screening of Remedial Alternatives
- Description and Detailed Analysis of Alternatives
- Comparative Analysis of Alternatives

The introduction will provide background information regarding site location, facility history, operation, and past investigations and removal actions. The nature of the problem will be presented as identified through the various studies and this RI. Site hydrogeological conditions, nature and extent of contamination, and risk assessment as developed in the RI report will also be summarized.

The RAOs, general response actions, identification and evaluation of remedial technologies, and the results of the remedial technologies screening will be described. The results of the initial screening of remedial alternatives with respect to effectiveness, implementability, and cost will be described. Remedial alternatives will be developed by combining the technologies selected during the screening process. A detailed description of the cost and non-cost features of each remedial action alternative passing the initial screening will be presented. A comparison of these alternatives will also be presented.

The draft FFS report will be reviewed by a CDM Smith TRC. TRC comments will be addressed prior to submittal to EPA, and other city, state, and federal agencies as directed by EPA for formal review and comment.

3.12.2 Final Feasibility Study Report

Upon receipt of all EPA and other federal and state written comments, CDM Smith will discuss comments with EPA prior to revising the FFS report for submittal to EPA. Once concurrence is received on the response to comments, CDM Smith will incorporate the responses and submit as the final FFS report.

3.13 Task 13 – Post RI/FS Support

CDM Smith will provide technical support as required for finalization of EPA's ROD based on the PRP's RI/FS for this site. CDM Smith will perform the following activities under this task:

- Attend technical meetings, public meetings, briefings, and public hearings to provide site updates
- Review presentation materials
- Provide technical assistance for preparation of the draft and final Responsiveness Summary and other ad-hoc submittals

3.14 Task 14 – Work Assignment Closeout

Project closeout includes work efforts related to the project completion and closeout phase. Project records will be transferred to EPA.

3.14.1 Document Indexing

CDM Smith will organize the WA files in its possession in accordance with the currently approved file index structure.

3.14.2 Document Retention/Conversion

All relevant paper files will be converted into the appropriate long-term storage format. The project files will be delivered to the EPA Records Center when the WA is complete.

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Section 4

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Tables

Table 3-1
Summary of Sampling and Analyses
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

Task	Description of Task	Sample Type	Field Screening	Analytical Parameters		Sampling Frequency/Intervals	ISOC Samples	Gamma Spec Samples	TCL/TAL Samples	Radon/ Thoron Samples
				Field Analyses	Non-RAS analyses					
3.3.3 Hydrogeological Assessment - Monitoring Well Installation	Monitoring Well Installation - five monitoring wells to depth of 75 feet bgs. Soils screened and sampled.	Soils	PID/ 2x2 NaI/ downhole geophysics	NA	NA	Monitoring Wells are co-located with deep borings in Task 3.3.5.2	NA	NA	NA	NA
3.3.5.1 Radiological Background Measurements - Soils	Background Soils - Surface and subsurface soil samples	Soils/ Survey	2x2 NaI, PIC	ISOC Samples	10% of samples Gamma Spec; TCL VOCs, SVOCs, PCBs, Pesticides TAL Metals	8 surface soil samples (0-2 feet bgs), 8 soil samples (2-10 feet bgs, 8 soil samples (10-30 feet bgs)	24	3	24	NA
3.3.5.1 Radiological Background Measurements - Sewers	Background Sewers - Surface and subsurface soil samples	Survey	2x2 NaI, PIC	NA	NA	Background dose rate and gamma count rate data collected from 2 unimpacted sewers	NA	NA	NA	NA
3.3.5.2 Soil Boring Investigation - Shallow Soil Borings	35 Shallow Soil Borings (to 10 feet bgs) to determine lateral extent of impacted soils	Soils	2x2 NaI, PID, Downhole Gamma	ISOC Samples	10% of samples Gamma Spec; TCL VOCs, SVOCs, PCBs, Pesticides TAL Metals	ISOC samples 5 per 10 foot interval Gamma spec collected for 10% of ISOC samples. 2 TCL/TAL samples select borings.	175	18	24	NA
3.3.5.2 Soil Boring Investigation - Deep Soil Borings	8 Deep Soil Borings (to 30 feet bgs) to determine vertical extent of impacted soils	Soils	2x2 NaI, PID, Downhole Gamma	ISOC Samples	10% of samples Gamma Spec; TCL VOCs, SVOCs, PCBs, Pesticides TAL Metals	ISOC samples 5 per 10 foot interval Gamma spec collected for 10% of ISOC samples. 2 TCL/TAL samples select borings.	120	12	16	NA
3.3.5.3 Radiological Building Materials Survey	Rad survey of WACC building materials with collection of core samples if necessary	Materials	2x2 NaI	ISOC Samples, Wipes, Air Samples	10% of samples Gamma Spec	Wipes and air samples during initial survey. ISOC samples of any cores collected. Assuming 20 core samples.	20	2	NA	NA
3.3.5.4 Sewer Investigation - Dose Rates	25 Sewer Manholes - Background dose rates	Survey	2x2 NaI, PIC	NA	NA	Dose rate and gamma count rate data collected from ~25 sewer vaults	NA	NA	NA	NA
3.3.5.4 Sewer Investigation - Soil Borings	10 Soil Borings (to 15 feet bgs) to determine extent of impacted soils surrounding sewers	Soils	2x2 NaI, PID, Downhole Gamma	ISOC Samples	10% of samples Gamma Spec	ISOC samples 5 per 10 foot interval Gamma spec collected for 10% of ISOC samples.	75	8	NA	NA
3.3.5.4 Sewer Investigation - Construction Materials	25 sewer manholes - collection of various construction materials samples	Sediments/ Materials	2x2 NaI	ISOC Samples	10% of samples Gamma Spec	Assuming 5 materials samples	5	1	NA	NA

Table 3-1
Summary of Sampling and Analyses
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

Task	Description of Task	Sample Type	Field Screening	Analytical Parameters		Sampling Frequency/Intervals	ISOC Samples	Gamma Spec Samples	TCL/TAL Samples	Radon/ Thoron Samples
				Field Analyses	Non-RAS analyses					
3.3.5.5 Gamma Exposure Rate Confirmation Readings	Confirmation readings throiughout site to confirm gamma exposure	Survey	PIC	NA	NA	Dose rate at select locations	NA	NA	NA	NA
3.3.5.6 School and Daycare Survey - Dose Rates	Dose Rate mapping using PIC in basement areas and outside grounds of the school and day care.	Survey	PIC	NA	NA	Dose rate at select locations	NA	NA	NA	NA
3.3.5.6 School and Daycare Survey - Soil Borings	6 Shallow Soil Borings (to 10 feet bgs) to determine if soils are impacted	Soils	2x2 NaI, PID, Downhole Gamma	ISOC Samples	10% of samples Gamma Spec	ISOC samples 5 per 10 foot interval Gamma spec collected for 10% of ISOC samples.	30	3	NA	NA
3.3.5.6 School and Daycare Survey - Radon Survey	Inspection of basements, surveying for gas entry points with a Pylon and collection of Radon/ Thoron in basements of the school/ daycare.	Air	RAD7 Portable Rad Meter	NA	Radon and Thoron	Realtime Radon/Thoron gas measurements as needed during basement inspection. Radon/ Thoron using ATDs (7 locations x 6 ATD per location)	NA	NA	NA	42
3.3.5.7 Hazardous Materials Survey	Collection of materials samples to determine presence of asbestos, lead, PCB or mercury containing materials within the WACC property.	Materials	NA	None	Asbestos, lead, PCBs, Hg	Sampling determined following an initial reconaissance survey by subcontractor. Samples collected and analyzed by subcontractor.	NA	NA	NA	NA
3.3.5.8 Hydrogeological Assessment - Monitoring Well Sampling	Monitoring Well Sampling - Two rounds of groundwater samples from five wells.	Groundwater	pH, Temp, Cond, DO, ORP and Turb	Ferrous Iron	TCL VOCs, SVOCs, PCBs, Pesticides TAL Metals (filtered and unfiltered), TOC, Gamma Spec	One sample per well	NA	10	10	NA

	ISOC Samples	Gamma Spec Samples	TCL/TAL Samples	Radon/ Thoron Samples
Total Samples	449	57	74	42
Total Soil Samples	449	47	64	0
Total Groundwater Samples	NA	10	10	0
Total Air Samples	NA	NA	NA	42
QA/QC	**45**	**6**	**7**	**4**
Total Samples	**494**	**63**	**81**	**46**

Acronyms:

ATDs Alpha Track Detectors
bgs below ground surface
Cond conductivity
DO dissolved oxygen
ISOC In Situ Object Counting System
NaI sodium iodide
ORP oxidation reduction potential
PID photo-ionization detector

Acronyms:

PID photo-ionization detector
RAS routine analytical services
SVOC semi-volatile organic compound
TAL target analyte list
TCL target compound list
Temp temperature
Turb turbidity
VOC volatile organic compound

Table 3-2
Proposed RI Report Format
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

1.0 Introduction
- 1.1 Purpose of Report
- 1.2 Site Background
  - 1.2.1 Site Description
  - 1.2.2 Site History
  - 1.2.3 Previous Investigations
- 1.3 Report Organization

2.0 Study Area Investigation
- 2.1 Survey
- 2.2 Hydrogeological Investigation
- 2.3 Radiological Background Assessment
- 2.4 Soil Boring Investigation
- 2.5 Radiological Building materials Survey
- 2.6 Sewer Investigation
- 2.7 Gamma Exposure Confirmation
- 2.8 School and Daycare Survey
- 2.9 Hazardous Building Materials Survey

3.0 Physical Characteristics of Site
- 3.1 Topography
- 3.2 Meteorology
- 3.3 Combined Sewer Systems
- 3.4 Geology
- 3.5 Hydrogeology
- 3.6 Soils
- 3.7 Demographics and Land Use

4.0 Nature and Extent of Contamination
- 4.1 Sources of Contamination
- 4.2 Soils
- 4.3 Groundwater
- 4.4 Sewer Sediments

5.0 Contaminant Fate and Transport
- 5.1 Routes of Migration
- 5.2 Contaminant Persistence
- 5.3 Contaminant Migration

6.0 Baseline Risk Assessment (submitted separately from RI report)

7.0 Summary and Conclusions
- 7.1 Source(s) of Contamination
- 7.2 Nature and Extent of Contamination
- 7.3 Fate and Transport
- 7.4 Risk Assessment
- 7.5 Data Limitations and Recommendations for Future Work
- 7.6 Recommended Remedial Action Objectives

Appendices: Boring Logs, Hydrogeologic Data, Analytical Data/QA/QC Evaluation

Table 3-3
Detailed Evaluation Criteria for Remedial Alternatives
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

- OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT
  - Time to achieve protectiveness
  - Impact to environment
  - Impact to human health

- COMPLIANCE WITH ARARs
  - Compliance with chemical-specific ARARs
  - Compliance with action-specific ARARs
  - Compliance with location-specific ARARs
  - Compliance with appropriate criteria, advisories and guidance

- LONG-TERM EFFECTIVENESS
  - Magnitude of risk remaining at the site after the response objectives have been met
  - Adequacy of controls
  - Reliability of controls

- REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT
  - Treatment process and remedy
  - Amount of hazardous material destroyed or treated
  - Reduction in toxicity, mobility or volume of the contaminants
  - Irreversibility of the treatment
  - Type and quantity of treatment residuals

- SHORT-TERM EFFECTIVENESS
  - Protection of community during remedial action
  - Protection of workers during remedial actions
  - Time until remedial response objectives are achieved
  - Environmental impacts

- IMPLEMENTABILITY
  - Ability to construct technology
  - Reliability of technology
  - Ease of undertaking additional remedial action, if necessary
  - Monitoring considerations
  - Coordination with other agencies
  - Availability of treatment, storage capacity, and disposal services
  - Availability of necessary equipment and specialists
  - Availability of prospective technologies

- COST
  - Capital costs
  - Annual operating and maintenance costs
  - Present worth
  - Sensitivity Analysis

Table 3-3
Detailed Evaluation Criteria for Remedial Alternatives
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

- STATE ACCEPTANCE
- COMMUNITY ACCEPTANCE

Table 3-4
Proposed Focused Feasibility Study Report Format
Wolf-Alport Chemical Company Site
Ridgewood, Queens, New York

1.0 Introduction and Site Background
- 1.1 Purpose and Organization of Report
- 1.2 Site Description and History
- 1.3 Site Background
- 1.4 Source(s) of Contamination
- 1.5 Nature and Extent of Contamination
- 1.6 Contaminant Fate and Transport
- 1.7 Risk Assessment Summaries

2.0 Identification and Screening of Remedial Technologies
- 2.1 Remedial Action Objectives
  - Contaminants of Interest
  - Allowable Exposure Based on Risk Assessment
  - Allowable Exposure Based on ARARs
  - Development of Remedial Action Objectives
- 2.2 General Response Actions
  - Volumes
  - Containment
  - Technologies
- 2.3 Screening of Technology and Process Options
  - 2.3.1 Description of Technologies
  - 2.3.2 Evaluation of Technologies
  - 2.3.3 Screening of Alternatives
  - Effectiveness
  - Implementability
  - Cost

3.0 Development and Initial Screening of Alternatives
- 3.1 Development of Alternatives
- 3.2 Screening of Alternatives
  - 3.2.1 Alternative 1
  - 3.2.2 Alternative 2
  - 3.2.3 Alternative 3

4.0 Description and Detailed Analysis of Alternatives
- 4.1 Description of Evaluation Criteria
  - Short-Term Effectiveness
  - Long-Term Effectiveness and Permanence
  - Implementability
  - Reduction of Mobility, Toxicity, or Volume Through Treatment
  - Compliance with ARARs
  - Overall Protection
  - Cost
  - State Acceptance
  - Community Acceptance

Table 3-4
Proposed Focused Feasibility Study Report Format
Wolf-Alport Chemical Company Site
Ridgewood, Queens, New York

	4.2	Individual Analysis of Alternatives	
		4.2.1	Alternative 1
		4.2.2	Alternative 2
		4.2.3	Alternative 3
	4.3	Summary	
5.0	Comparative Analysis of Alternatives		
	5.1	Comparison Among Alternatives	

Figures

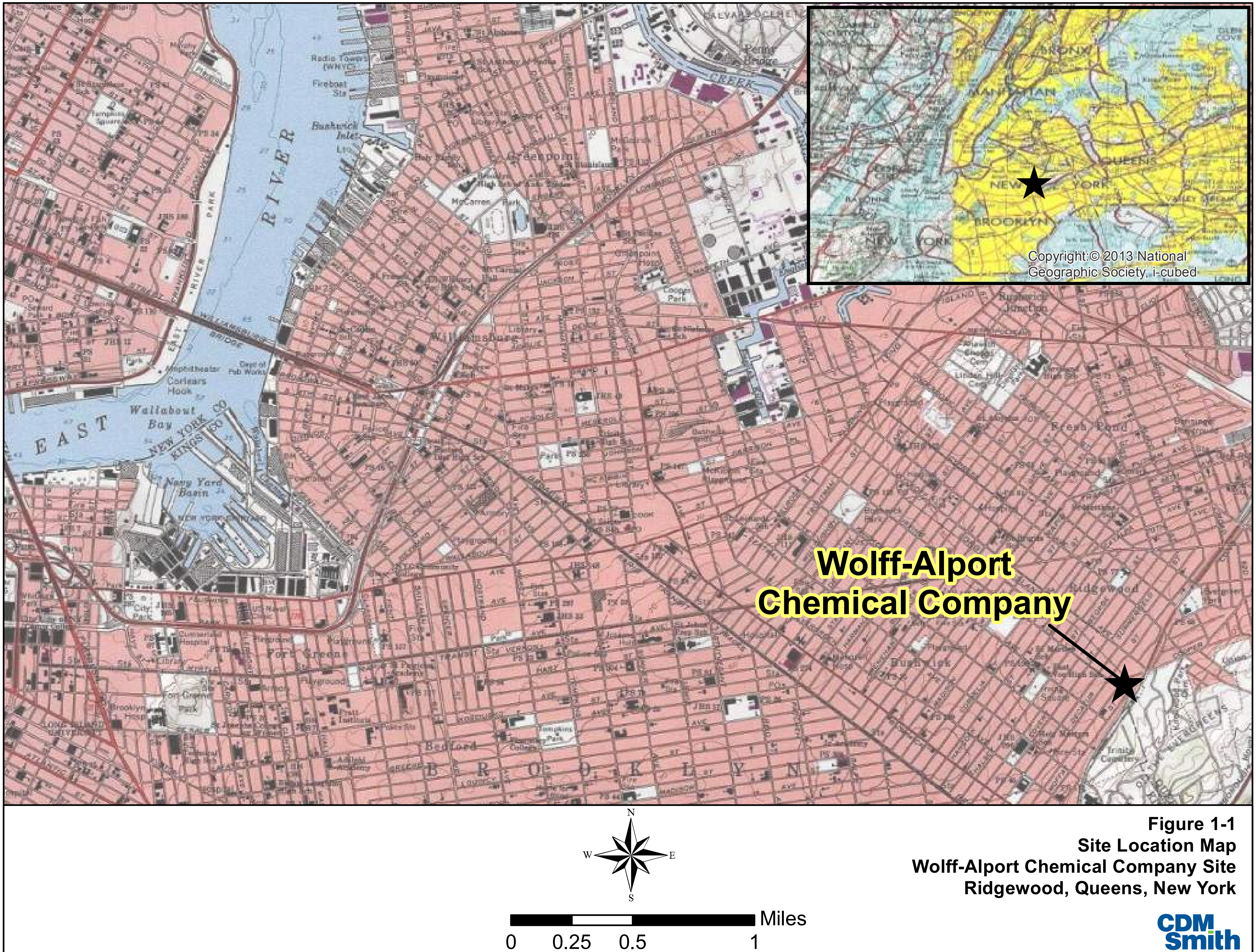


Figure 1-1
Site Location Map
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

Figure 1-2
Site Plan
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

Figure 2-1
Project Organization
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

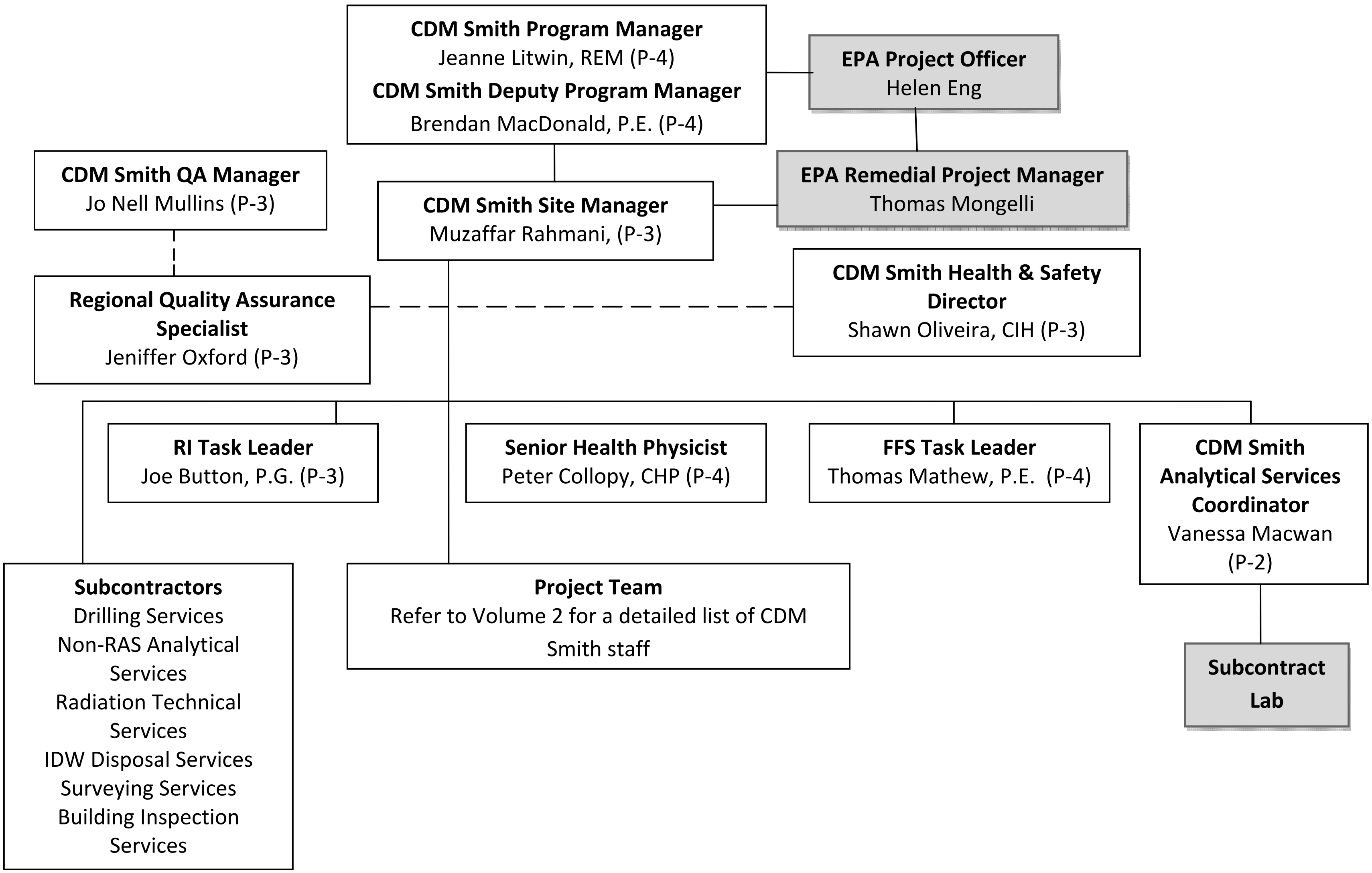
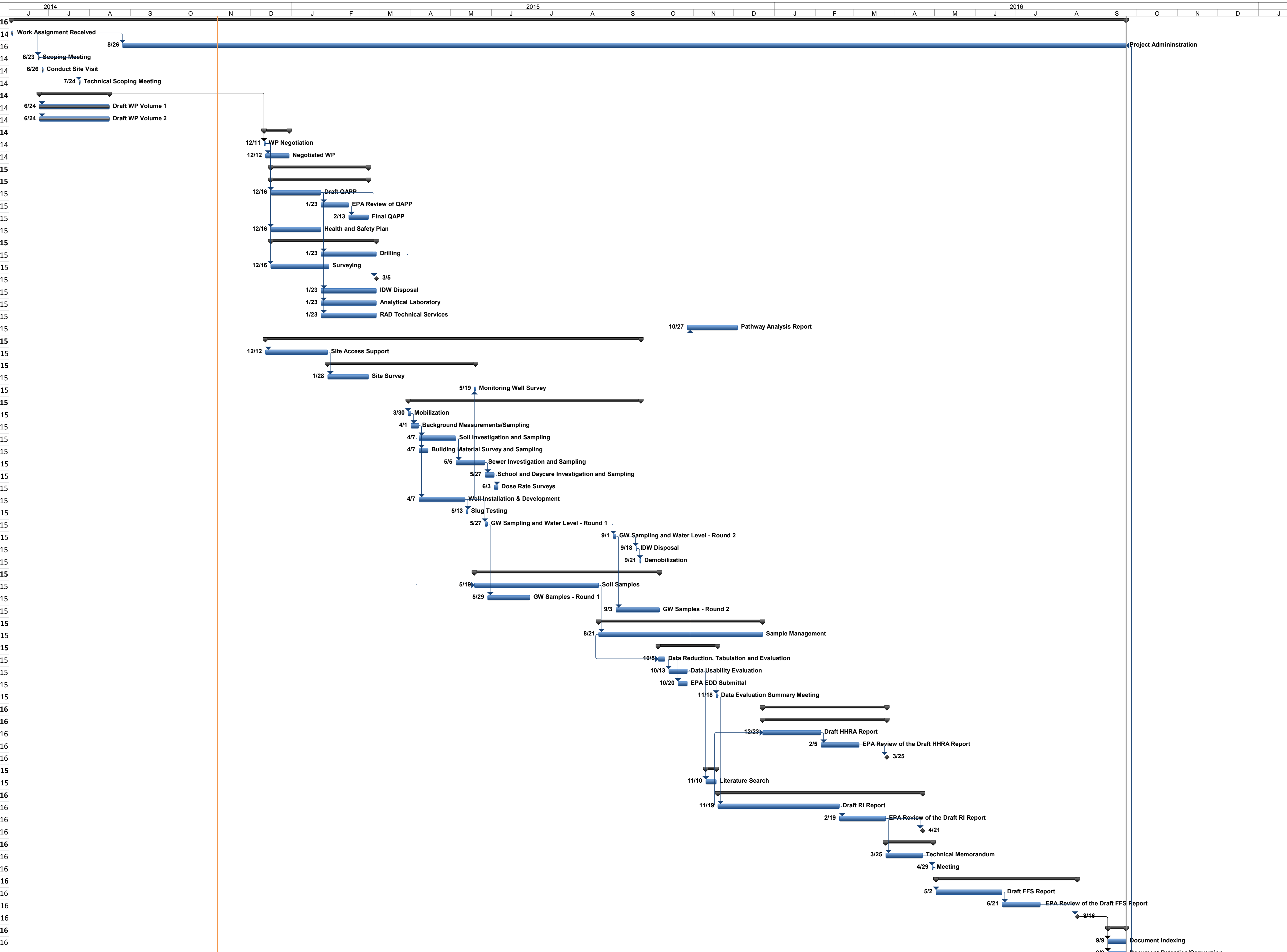


Figure 2-2
Proposed Project Schedule
Remedial Investigaiton/Focused Feasibilty Report
Wolff-Alport Chemcial Company Site
Ridgewood, Queens, New York

ID	Task Name	Duration	Start	Finish
1	**Task 1 - Project Planning and Support**	**579 days**	**Tue 6/3/14**	**Thu 9/22/16**
2	Work Assignment Received	1 day	Tue 6/3/14	Tue 6/3/14
3	Project Admininstration	520 days	Tue 8/26/14	Thu 9/22/16
4	Scoping Meeting	1 day	Mon 6/23/14	Mon 6/23/14
5	Conduct Site Visit	1 day	Thu 6/26/14	Thu 6/26/14
6	Technical Scoping Meeting	1 day	Thu 7/24/14	Thu 7/24/14
7	**Prepare Draft WP and Cost Estimate**	**38 days**	**Tue 6/24/14**	**Fri 8/15/14**
8	Draft WP Volume 1	38 days	Tue 6/24/14	Fri 8/15/14
9	Draft WP Volume 2	38 days	Tue 6/24/14	Fri 8/15/14
10	**Negotiate and Revise Draft WP and Budget**	**12 days**	**Thu 12/11/14**	**Mon 12/29/14**
11	WP Negotiation	1 day	Thu 12/11/14	Thu 12/11/14
12	Negotiated WP	11 days	Fri 12/12/14	Mon 12/29/14
13	**Project Plans**	**50 days**	**Tue 12/16/14**	**Fri 2/27/15**
14	**Quality Assurance Project Plan (QAPP)**	**50 days**	**Tue 12/16/14**	**Fri 2/27/15**
15	Draft QAPP	25 days	Tue 12/16/14	Thu 1/22/15
16	EPA Review of QAPP	15 days	Fri 1/23/15	Thu 2/12/15
17	Final QAPP	10 days	Fri 2/13/15	Fri 2/27/15
18	**Health and Safety Plan**	**25 days**	Tue 12/16/14	Thu 1/22/15
19	**Subcontract Procurement**	**54 days**	**Tue 12/16/14**	**Thu 3/5/15**
20	Drilling	29 days	Fri 1/23/15	Thu 3/5/15
21	Surveying	29 days	Tue 12/16/14	Wed 1/28/15
22	Building Material Inspection	29 days	Fri 1/23/15	Thu 3/5/15
23	IDW Disposal	29 days	Fri 1/23/15	Thu 3/5/15
24	Analytical Laboratory	29 days	Fri 1/23/15	Thu 3/5/15
25	RAD Technical Services	29 days	Fri 1/23/15	Thu 3/5/15
26	**Pathway Analysis Report**	25 days	Tue 10/27/15	Thu 12/3/15
27	**Task 3 - Field Investigation**	**195 days**	**Fri 12/12/14**	**Mon 9/21/15**
28	Site Access Support	30 days	Fri 12/12/14	Tue 1/27/15
29	**Site Reconnaissance**	**79 days**	**Wed 1/28/15**	**Tue 5/19/15**
30	Site Survey	22 days	Wed 1/28/15	Fri 2/27/15
31	Monitoring Well Survey	1 day	Tue 5/19/15	Tue 5/19/15
32	**Remedial Investigation**	**123 days**	**Mon 3/30/15**	**Mon 9/21/15**
33	Mobilization	2 days	Mon 3/30/15	Tue 3/31/15
34	Background Measurements/Sampling	4 days	Wed 4/1/15	Mon 4/6/15
35	Soil Investigation and Sampling	20 days	Tue 4/7/15	Mon 5/4/15
36	Building Material Survey and Sampling	5 days	Tue 4/7/15	Mon 4/13/15
37	Sewer Investigation and Sampling	15 days	Tue 5/5/15	Tue 5/26/15
38	School and Daycare Investigation and Sampling	5 days	Wed 5/27/15	Tue 6/2/15
39	Dose Rate Surveys	3 days	Wed 6/3/15	Fri 6/5/15
40	Well Installation & Development	25 days	Tue 4/7/15	Mon 5/11/15
41	Slug Testing	1 day	Wed 5/13/15	Wed 5/13/15
42	GW Sampling and Water Level - Round 1	2 days	Wed 5/27/15	Thu 5/28/15
43	GW Sampling and Water Level - Round 2	2 days	Tue 9/1/15	Wed 9/2/15
44	IDW Disposal	1 day	Fri 9/18/15	Fri 9/18/15
45	Demobilization	1 day	Mon 9/21/15	Mon 9/21/15
46	**Task 4 - Sample Anaysis**	**97 days**	**Tue 5/19/15**	**Mon 10/5/15**
47	Soil Samples	66 days	Tue 5/19/15	Thu 8/20/15
48	GW Samples - Round 1	22 days	Fri 5/29/15	Mon 6/29/15
49	GW Samples - Round 2	22 days	Thu 9/3/15	Mon 10/5/15
50	**Task 5 - Analytical Support and Data Validation**	**83 days**	**Fri 8/21/15**	**Tue 12/22/15**
51	Sample Management	83 days	Fri 8/21/15	Tue 12/22/15
52	**Task 6 - Data Evaluation**	**31 days**	**Mon 10/5/15**	**Wed 11/18/15**
53	**Data Reduction, Tabulation and Evaluation**	5 days	Mon 10/5/15	Fri 10/9/15
54	**Data Usability Evaluation**	10 days	Tue 10/13/15	Mon 10/26/15
55	**EPA EDD Submittal**	5 days	Tue 10/20/15	Mon 10/26/15
56	**Data Evaluation Summary Meeting**	1 day	Wed 11/18/15	Wed 11/18/15
57	**Task 7 Assessment of Risk**	**64 days**	**Wed 12/23/15**	**Fri 3/25/16**
58	**Human Health Risk Assessment (HHRA)**	**64 days**	**Wed 12/23/15**	**Fri 3/25/16**
59	Draft HHRA Report	29 days	Wed 12/23/15	Thu 2/4/16
60	EPA Review of the Draft HHRA Report	20 days	Fri 2/5/16	Fri 3/4/16
61	Final HHRA Report	15 days	Mon 3/7/16	Fri 3/25/16
62	**Task 8 - Treatability Study and Pilot Testing**	**5 days**	**Tue 11/10/15**	**Tue 11/17/15**
63	Literature Search	5 days	Tue 11/10/15	Tue 11/17/15
64	**Task 9 - Remedial Investigation (RI) Report**	**105 days**	**Thu 11/19/15**	**Thu 4/21/16**
65	Draft RI Report	60 days	Thu 11/19/15	Thu 2/18/16
66	EPA Review of the Draft RI Report	25 days	Fri 2/19/16	Thu 3/24/16
67	Final RI Report	20 days	Fri 3/25/16	Thu 4/21/16
68	**Task 10 - Remedial Alternative Screening**	**26 days**	**Fri 3/25/16**	**Fri 4/29/16**
69	Technical Memorandum	20 days	Fri 3/25/16	Thu 4/21/16
70	Meeting	1 day	Fri 4/29/16	Fri 4/29/16
71	**Task 12 - Focused Feasibility Report (FFS) Report**	**75 days**	**Mon 5/2/16**	**Tue 8/16/16**
72	Draft FFS Report	35 days	Mon 5/2/16	Mon 6/20/16
73	EPA Review of the Draft FFS Report	20 days	Tue 6/21/16	Tue 7/19/16
74	Final FFS Report	20 days	Wed 7/20/16	Tue 8/16/16
75	**Task 13 - Work Assignment Closeout**	**10 days**	**Fri 9/9/16**	**Thu 9/22/16**
76	Document Indexing	10 days	Fri 9/9/16	Thu 9/22/16
77	Document Retention/Conversion	10 days	Fri 9/9/16	Thu 9/22/16



Project: WA 054 Wolff-Alport RI/FFS
Date: Thu 11/6/14

Task | Milestone ◆ | Summary | Progress

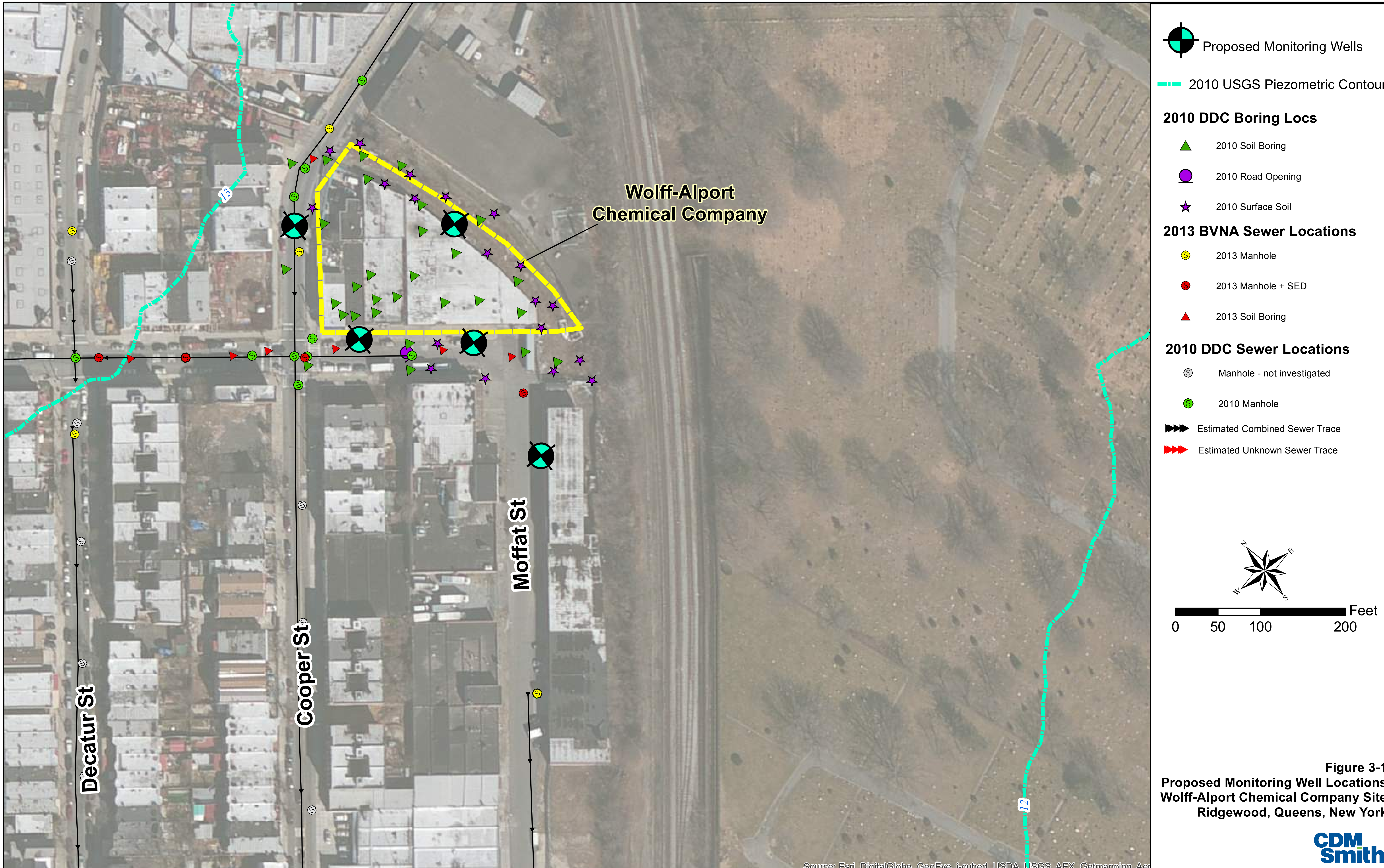


Figure 3-1
Proposed Monitoring Well Locations
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

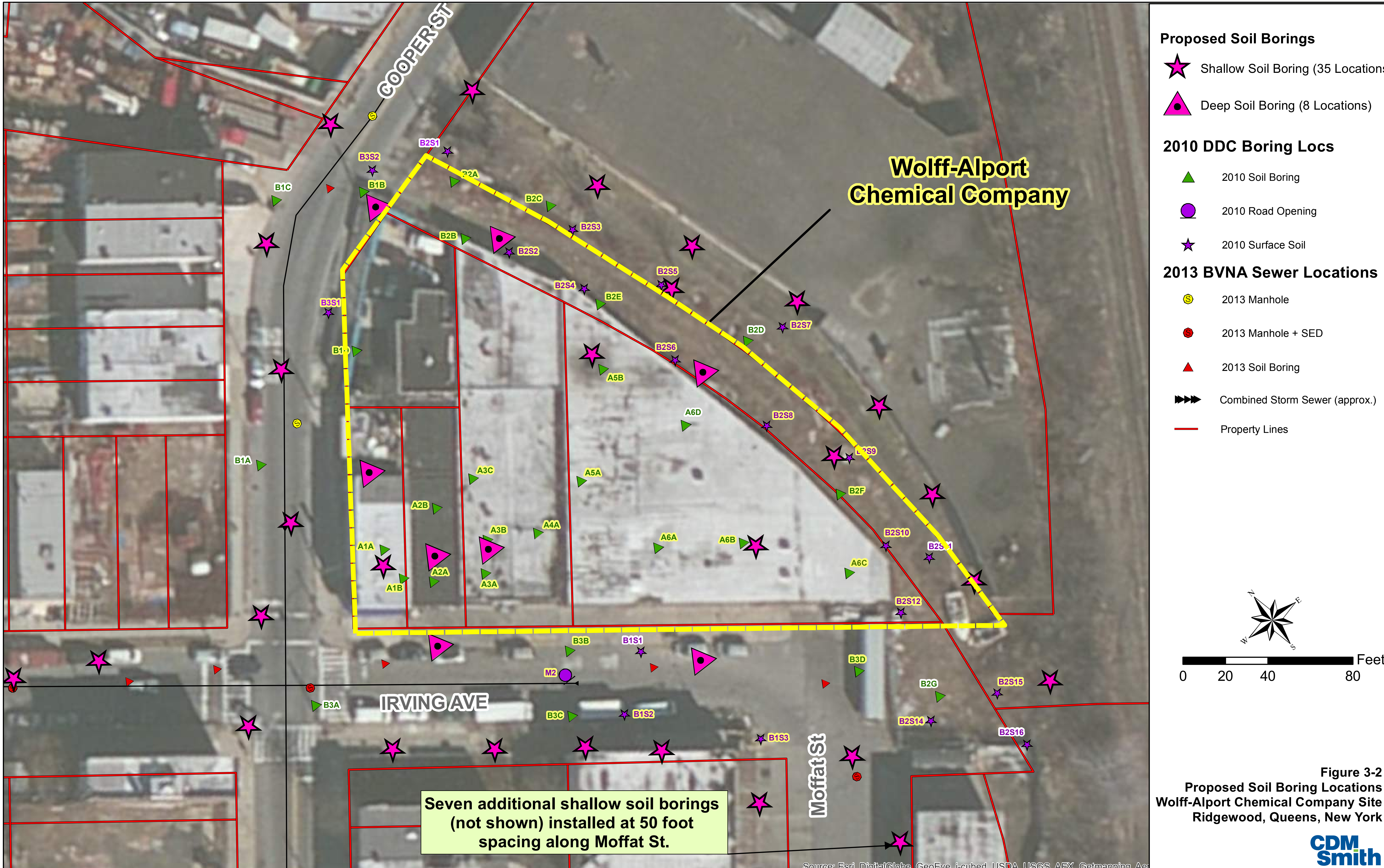
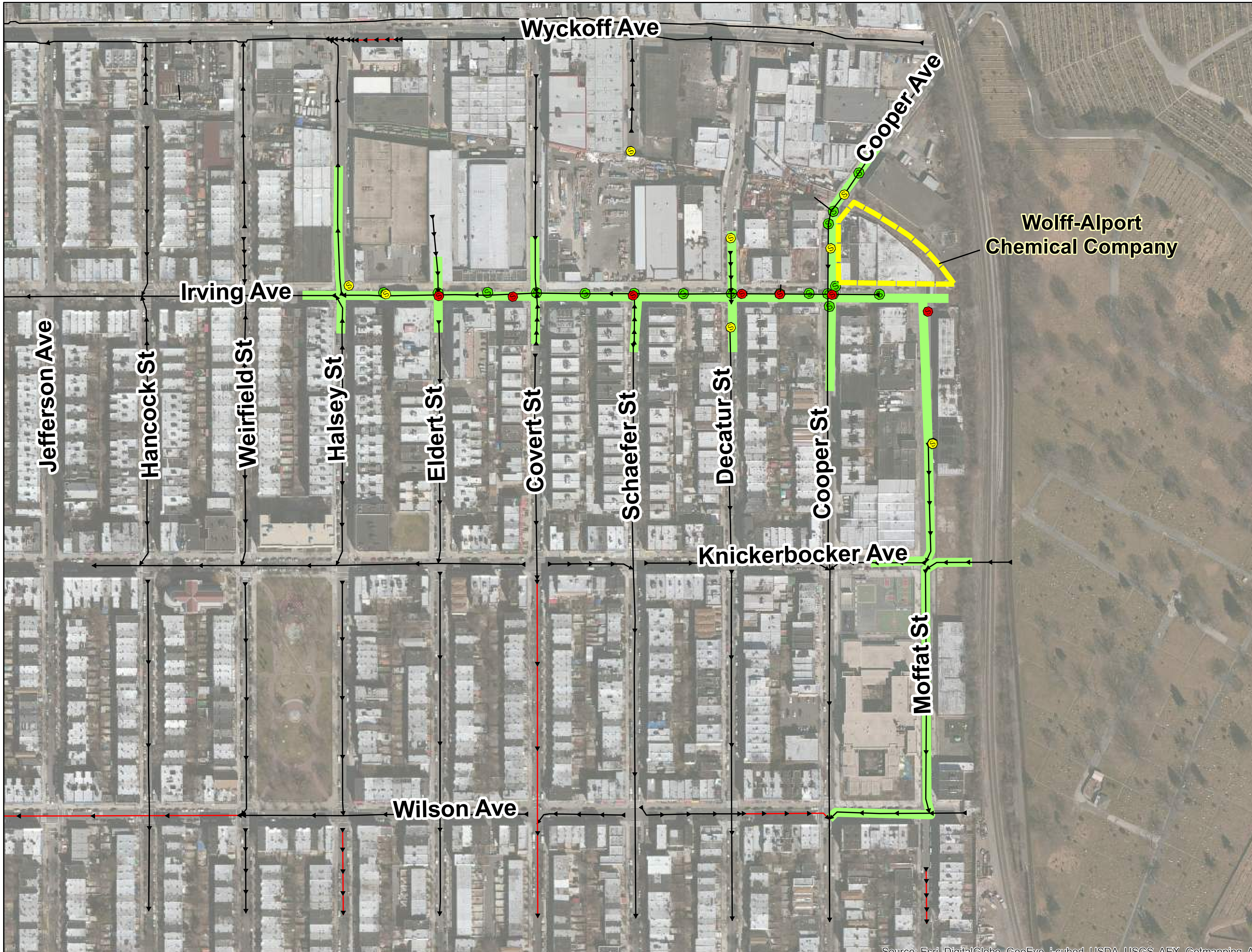


Figure 3-2
Proposed Soil Boring Locations
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York



2013 BVNA Sewer Locations

2013 Manhole

2013 Manhole + SED

2010 DDC Sewer Locations

Manhole - not investigated

2010 Manhole

Proposed Sewer Survey Area

Combined Storm Sewer (approx.)

Unknown Sewer (approx.)

Feet
0 125 250 500

Figure 3-3
Proposed Sewer Survey Locations
Wolf-Allport Chemical Company.Site
Ridgewood, Queens, New York

CDM Smith

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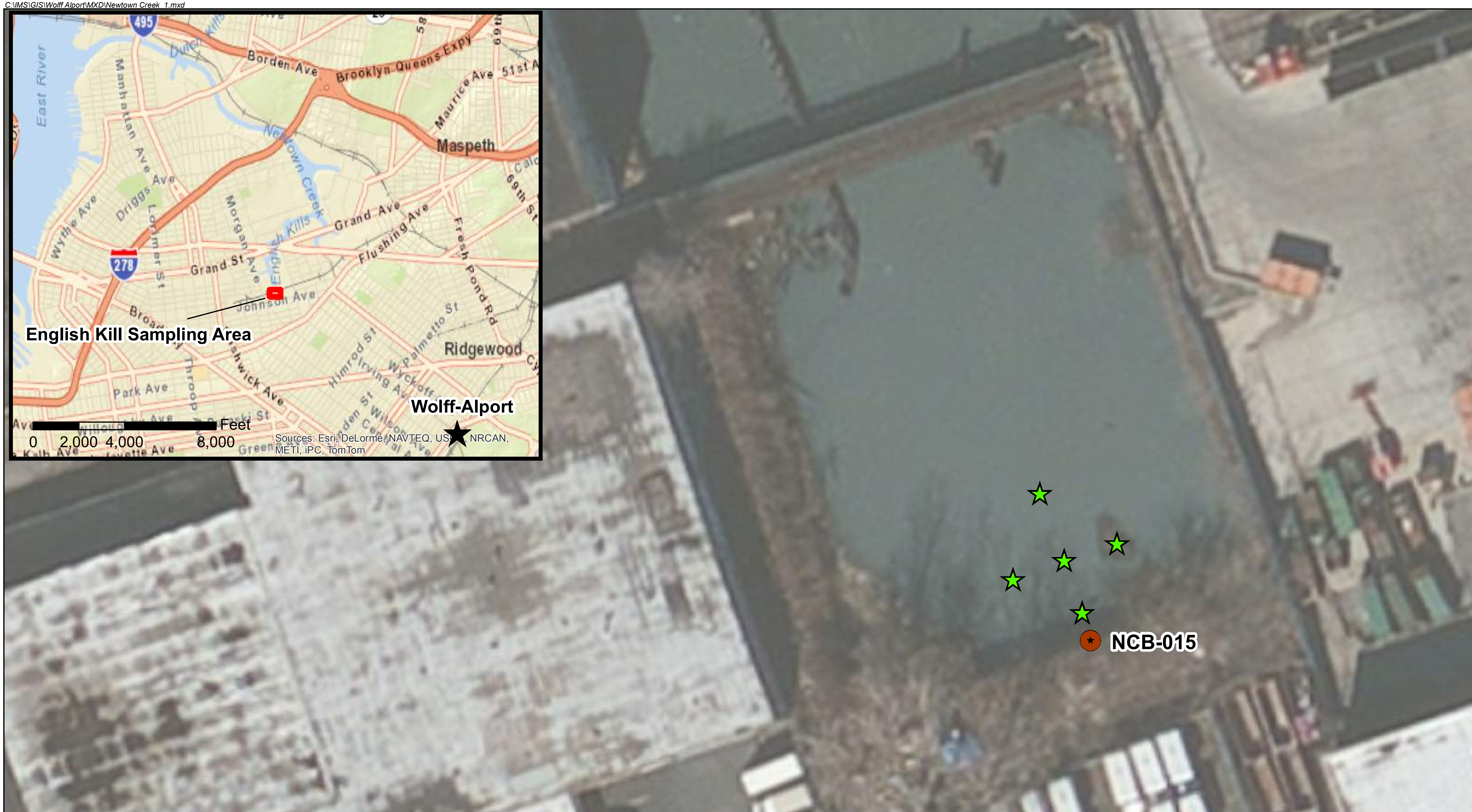

Proposed Sediment Core Location

Approximate Combined Sewer Overflow Discharge Location (Morgan Avenue Interceptor East)

N

Feet

0 15 30 60

Figure 3-4
Proposed Sediment Sampling Locations
Newtown Creek - English Kill
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

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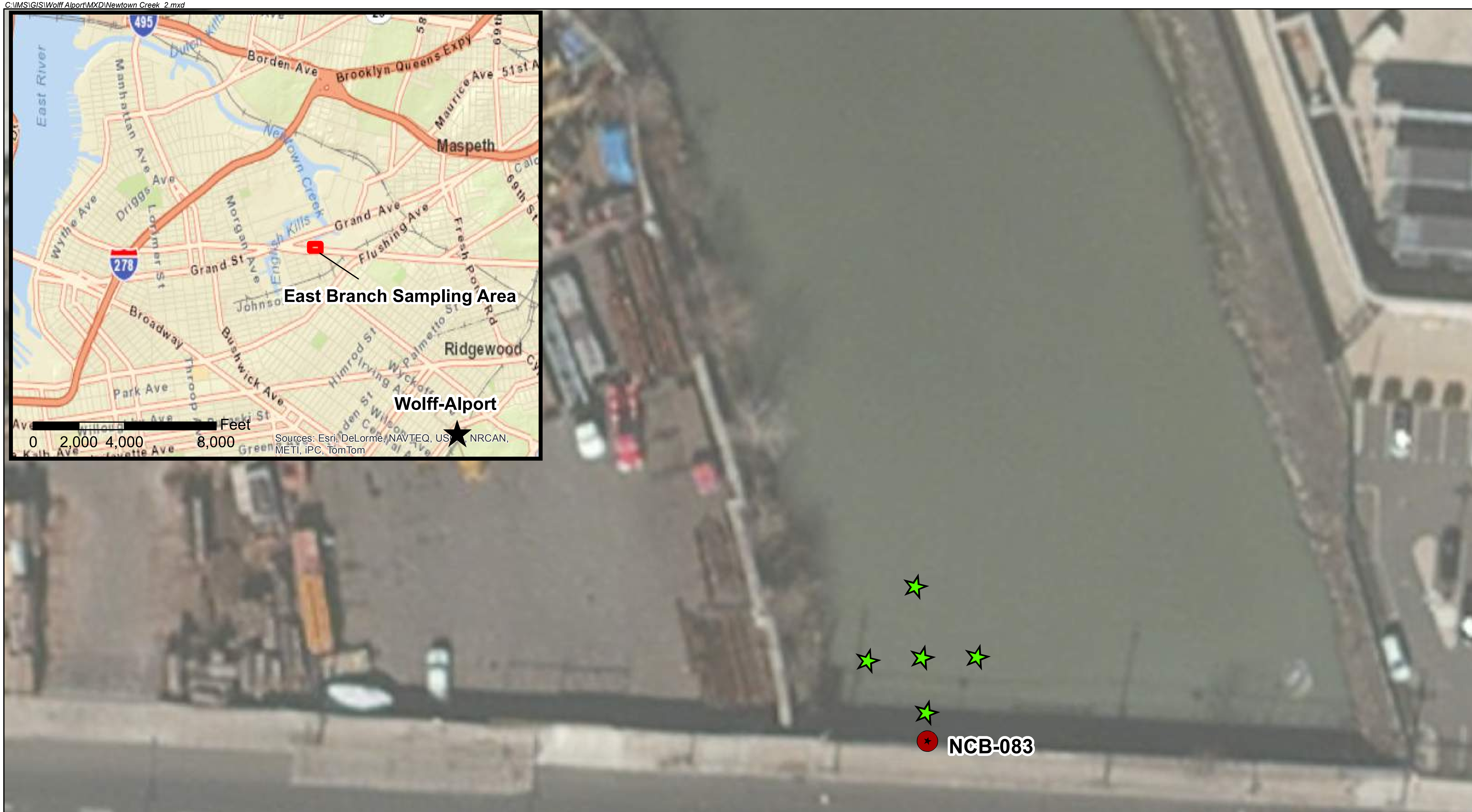

Proposed Sediment Core Location

Approximate Combined Sewer Overflow Discharge Location (Morgan Avenue Interceptor East)

N

Feet
0 15 30 60

Figure 3-5
Proposed Sediment Sampling Locations
Newtown Creek - East Branch
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

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Proposed Background Sediment Core Location

Proposed Background Surface Sediment Location

N

Feet
0 250 500 1,000

Figure 3-6
Proposed Background Sediment Sampling Locations
Coney Island Creek
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith